

University of Delaware
Disaster Research Center

REPORT SERIES
#3

THE DEPARTMENT OF PUBLIC WORKS:
A COMMUNITY EMERGENCY ORGANIZATION

John R. Brouillette

December, 1968

Report prepared for Office of Civil Defense, Office of the Secretary of
the Army, Washington, D.C. 20310

OCD REVIEW NOTICE: This report has been reviewed in the Office of
Civil Defense and approved for publication. Approval does not signify
that the contents necessarily reflect the views and policies of the
Office of Civil Defense.

CONTRACT OCD-PS-64-46; WORK UNIT 2651-A

THIS DOCUMENT HAS BEEN APPROVED FOR PUBLIC RELEASE AND SALE: ITS
DISTRIBUTION IS UNLIMITED.

TABLE OF CONTENTS

	Page
LIST OF ILLUSTRATIONS	v
 Chapter	
I. INTRODUCTION	1
Natural Disaster	
Community Focus	
Types of Organized Behavior in Disasters	
Sources of Data	
 II. THE METROPOLITAN PUBLIC WORKS DEPARTMENT	 9
Overview	
Personnel and Physical Resources	
A Multi-Purpose Organization	
A Monopoly	
Bureaucratic Attributes	
Types of Organizational Structure	
Potential Disaster Related Demands	
Disaster Plan	
Tasks Priorities	
 III. EMERGENCY TASKS	 25
Phases of Disaster	
Warning Phase	
Warning Dissemination	
Notification and Mobilization of Organization Personnel	
and Readyng Resources	
Protecting Persons and Equipment Against the Effects of	
the Disaster Agent	
Averting the Disaster Agent	
Emergency Phase	
Rehabilitation Phase	
Concluding Remarks	

IV. EMERGENCY STRUCTURE	39
Levels of Organizational Demand	
LEVEL I: Normal Periods	
LEVEL II: Periodic Anticipated Emergencies	
LEVEL III: Unanticipated Disaster I	
LEVEL IV: Unanticipated Disaster II	
Organizational Expansion	
V. INTERORGANIZATIONAL RELATIONSHIPS	56
Pre-Emergency Relations	
Community Organizations	
Extra-Community Relations	
Emergency Relations	
Relations with Nonemergency Organizations	
VI. IMPLICATIONS FOR ORGANIZATIONAL FUNCTIONING IN A NUCLEAR CATASTROPHE	67
Resources and Tasks	
Relative Effectiveness	
Persistent Problems	

LIST OF ILLUSTRATIONS

Figure	Page
1. Types of Organized Behavior in Disasters	4
2. Organizational Chart of a Department of Public Works Based on <u>Tasks</u> Performed	16
3. Organizational Chart of a Department of Public Works Based on <u>Functions</u> Performed	18
4. Organizational Chart of a Department of Public Works Based on Both <u>Tasks and Functions</u> Performed	20
5. Eight Stages of Natural Disasters Along a Time Dimension	26
6. Disaster Activated Activities and Processes	27
7. Organizational Chart Showing the Normal Structure of the Department of Public Works' Engineering Department	44
8. Organizational Chart Showing the New Structure of the Department of Public Works' Engineering Department	45
9. Ratio of Supervised to Unsupervised Decisions of Lower Echelon Personnel During Several Levels of Emergency Activity	47
10. Relationship Between Level of Demand and Subsequent Type of Organizational Adaptation	50
11. Relationship Between the Department of Public Works and Other Organizations	59

CHAPTER I

INTRODUCTION

Departments of public works have not been studied very extensively by social scientists. In over 200 studies of natural disasters summarized by the staff of the Disaster Research Center, there were only a handful of descriptions of the activities of such organizations. Yet public work departments are almost inevitably involved in any large-scale community emergency.

There are several reasons for this lack of attention. First, the organization is not highly visible to the general public. Its personnel do not wear uniforms which stand out and its vehicles, even when displaying emblems, are not as conspicuous as police cars or fire trucks. Second, the department works with "things," not "people." Therefore, department personnel often go unnoticed as they perform their tasks. Only when a public facility or service breaks down, does the public works department become indirectly visible. Third, the organization often deals with very specific and highly technical engineering problems, which the general public does not understand and, furthermore, is unable to evaluate. Finally, many take the organization's responsibilities for granted. It is expected to function as it does in disasters. In the minds of many, this adds up to a highly invisible, not very colorful organization carrying out dull tasks which are not clearly understood by the public.

Yet the role which the department plays in disasters is often of critical importance to the community -- preparing it for a possible disaster, engaging in emergency activities during the immediate post-impact period, and helping to restore it to a normal state. The department of public works (DPW)*, one of the community's largest organizations, normally has extensive resources and critical skills at its disposal which are necessary if the community is to cope successfully with a disaster.

Natural Disaster

"Disaster" has been used in several different ways, referring to the agent itself, the physical damage, or the social disruption. For our purposes the definitions given by Fritz and by Sjoberg appear most apropos to our analysis. Fritz defines "disaster" as:

. . . an event, concentrated in time and space, in which a society, or a relatively self-sufficient subdivision of a society, undergoes severe danger and incurs such losses to its members and physical appurtenances that the social structure is disrupted and the fulfillment of all or some of the essential functions of the society is prevented.¹

*Throughout the present monograph we will refer to the "department of public works" as the DPW.

In a similar manner, Sjoberg refers to "disaster" as:

... a severe, relatively sudden, and frequently unexpected disruption of normal structural arrangements within a social system, or subsystem, resulting from a force, "natural" or "social," "internal" to a system or "external" to it, over which the system has no firm control.²

With the exception that we are concerned with "natural" rather than "social" forces, and "community" rather than "society," these definitions appear to bear directly on our discussion. A disaster agent causes or threatens to cause physical disruption to the community or organization impairing normal functioning. This disruption may be large or small, affecting an entire community or only a small segment of it, lasting for months or only a day. However, the present report will focus on community, rather than on strictly organizational disasters. More specifically we are interested in the DPW's activities during a community disaster.

It should be emphasized that there need be no relationship between an organizational disaster and a community disaster. An agent causing severe disruption to the orderly functioning of an organization may not disturb the "business as usual" atmosphere in the community. For example, an explosion in a retail store killing store officials and causing extensive damage to its contents may be disastrous for the store but have few consequences for the community at large. In a similar manner, the Indianapolis Coliseum explosion was a major disaster for several organizations responsible for transporting and caring for the injured, but less disruption occurred to the community as a whole.

Still a relationship between an organizational and community disaster often exists. In our example of the coliseum explosion, some disruption on the community level did occur; nearly 600 persons were either dead or injured. The fact that such a small percentage of the total population was killed or its well-being threatened is not important. For community impairment is a matter of degree. In this sense valued ends of the community were threatened, not very seriously but they were threatened. Indianapolis diverted some of its energy, through its organizations, to cope with a relatively localized community disaster. A minor community disaster, such as this, had major consequences for certain organizations. A case in point was that several of the city's hospitals were severely disrupted for a period of time after impact. At the other extreme, the DPW was not affected, and therefore it experienced no disaster.

In addition, it should be noted that the actual physical disruption need not occur for a community to experience a disaster; the threat of one is often sufficient to cause severe disruption of normal activities. The sound of a siren or an announcement over the radio of an impending tornado or a weather bulletin predicting floods may be more than sufficient to cause threat to valued ends and therefore lead to organizational adaptation. In this report we are concerned only with those community disasters which have relevance for

the DPW and its subsequent adaptation. "Community disaster" will be viewed as the independent variable and "organizational response" as the dependent one.

It is necessary to take up one other matter before proceeding. At times we will refer to the response of the DPW as if the disaster affected the total organization. We use this technique only as an analytical tool; one should not be misled into thinking that "this is the way it really is." It is not. Emergencies affect the divisions within the organization differentially. Each division has a unique set of responsibilities and personnel with unique skills. When a disaster agent strikes, it usually presents greater problems for one division than another. One might find for example, that the survey bureau was heavily involved during the warning phase, the maintenance bureau during the emergency period, and the construction division during the rehabilitation phase. It is not always easy to answer a question such as, "When was the DPW most heavily involved?" The answer may be different for each of the various subunits of the organization.

Community Focus

Yutzy defined "community" as "a spatially and environmentally contingent interaction system which functions to provide daily local access to the necessities and desired amenities of day-to-day living."³ It is not our purpose here to analyze and describe fully all of the ramifications of "community." Rather we will focus on only one aspect of it, the protection of community necessities and valued ends.

Yutzy lists five community functions suggested by Warren and adds a sixth of his own.⁴

1. Production-distribution-consumption
2. Socialization
3. Social participation
4. Social control
5. Mutual support
6. Preservation of life and property

In our "organizational society" it is increasingly the ongoing organizations which play the most important role in maintaining these community functions. It is within this community framework that we will describe the typical DPW. It is one of many organizations which attempts to maintain a smoothly operating community with minimum disruption.

Many organizations are not oriented toward the protection of the community's valued ends. Organizations may be classified on the basis of whether they have a community orientation and emergency resources.⁵

Some /organizations/ are organized to deal with problems relevant to the "whole" community while others have more "private" goals to which they are oriented.

In a like manner,

Organizations differ as to whether they possess what might be called emergency resources.

Cross-classifying organizations on the basis of "community orientation" and "emergency resources" results in four types of community organizations: (1) community emergency organizations, such as police, fire, DPW, Red Cross, and utilities; (2) community relevant organizations, such as welfare, religious, and service organizations; (3) emergency relevant organizations, such as private contractors with heavy equipment and a department store with trucks; (4) non-relevant organizations, such as a luxury retail store and entertainment organizations.⁶

Those of the first type, the community emergency organizations, have the major responsibility and vast resources with which to maintain the community as a viable functioning entity. This means that they are also "the first line of defense" to protect the community's valued ends when they are threatened by a natural disaster. Several of these organizations are public under the jurisdiction of the city's mayor or city manager. Such is the case with the DPW. In the next chapter we will see how the DPW fits into this organizational web to help protect the community's valued ends.

Types of Organized Behavior in Disasters⁷

Both organizations and emergency groups respond to many community disasters. They do not, however, respond in the same way, carry on identical tasks, have similar structure, nor face the same problems. Thus, it is useful for certain analytical purposes to categorize the involved groups in such a way that will allow us to compare the differences in structure and functions in the pre-emergency period with those found during the disaster. This approach should enable us to ascertain the conditions leading to changes in organizational behavior as well as the direction of the alterations that do occur.

Four types of adaptation or problem solving modes evolve during crises which we will designate as Type I, II, III, and IV. The four types are arrived at through cross-classification of two variables -- structure and tasks -- and are depicted in Figure 1.

Figure 1. -- Types of Organized Behavior in Disasters

		TASKS	
		Regular	New
STRUCTURE	Old	Type I (Established)	Type III (Extending)
	New	Type II (Expanding)	Type IV (Emergent)

Type I is an established organization which carries out regular tasks. Examples of this type would include a telephone company restoring communications after a hurricane struck a city; a police department directing traffic around a community hit by an earthquake; or a DPW clearing debris from city streets following a tornado.

Type II is an expanding organization which carries out regular tasks. In these organizations only a small segment (the core) exists prior to the emergency. They are primarily "paper organizations" which expand their personnel greatly during crises. Examples of this type would include regular "volunteers running a shelter after a hurricane, supervised by a permanent Red Cross official" or Salvation Army volunteers dispensing sandwiches and clothing to victims after a tornado under the auspices of the permanent Salvation Army core.

Type III is an extending organization which carries out new tasks. Examples of this type would include a church school which operated a shelter for refugees during a flood or a construction company engaged in debris clearance after a major explosion in a community.

Type IV is an emergent group which carries out new tasks. We refer to these as "groups" rather than as "organizations" because they have no pre-disaster history. An example of this type would include an ad hoc group made up of officials from the mayor's office, DPW, local civil defense, fire department, police department, Red Cross, and county engineer's office which coordinated the overall community assault during a flood.

This typology is very useful in pointing out differential consequences of undertaking different types of adaptation. For example, we should expect Type I organizations to have different problems from those of Type II when they deal with crises. We should also be able to show what types of pre-disaster organizational structure and responsibilities cause organizations to adapt using a Type I rather than Type II, III or IV response. Dynes discusses at great length the implications of groups responding to emergencies in one of the four ways presented in his typology.⁸ In this report we are interested only in the DPW and its mode of adaptation to crises.

Sources of Data

The report is based on data collected from two sources: (1) prior disaster research carried out by various agencies and (2) field research carried out by The Ohio State University Disaster Research Center. With regard to prior research, the Disaster Research Center serves as the repository for data collected by other agencies. The Center has analyzed most of the previous research, emphasizing the organizational involvement which took place.

The Center, established in 1963, has studied group and organizational adaptation in community-wide crises. Since its inception, studies have been conducted in 52 different emergencies including earthquakes (in Japan, Alaska, Chile, El Salvador, and Greece), hurricanes (in Florida and Louisiana), floods (in Montana, Texas, California, Ohio, Colorado, Iowa, and Minnesota), as well as tornadoes (in Indiana, Iowa, Kansas, Florida, Arkansas, and Mississippi).

Large explosions and fires, destructive seismic waves and major dam breaks have also been studied in such places as Australia, Italy, Canada, and different parts of the United States. DPW functioning has been studied in many of the disasters, including rather extensive field work on its operation during the Alaskan earthquake; Minnesota, Cincinnati and Montana floods; and the great Chicago snowstorm.⁹

The data collected by the Center comes from several sources, including tape-recorded interviews with personnel from all levels of the organization, participant observation, organizational logs and written material (minutes of meetings, organizational charts, manual of standard operating procedures, disaster plans, "after action" reports, et cetera).

Thus far, we have defined natural disaster as it will be used in this report. We then discussed very briefly the nature of the community and the increasingly important role community organizations play in maintaining it with a minimum of disruption. Next, we presented the conceptual model within which the DPW will be described. Finally, the sources of data which serve as the basis of our analysis were described.

In Chapter II we will describe a typical metropolitan DPW in the United States. Chapter III is concerned primarily with the tasks undertaken by the department during disasters. Here the focus is on the organization as a whole. In Chapter IV we will describe the internal or structural changes which a typical department goes through as it adapts to emergency demands. No organization functions in isolation. Chapter V depicts the interrelationships between the DPW and other agencies and organizations in the community and/or larger society. Finally, Chapter VI describes the implication of the department's usual activities during a natural disaster and what might be expected in a nuclear disaster.

FOOTNOTES: Chapter I

1. Charles E. Fritz, "Disaster," Contemporary Social Problems, ed. Robert K. Merton and Robert A. Nisbet (New York: Harcourt, Brace and World, Inc., 1961), p. 655.
2. Gideon Sjoberg, "Disasters and Social Change," Man and Society in Disaster, ed. George Baker and Dwight Chapman (New York: Basic Books, Inc., 1962), p. 357.
3. Daniel Yutzy, "Functional Priorities in Community Disasters," DRC Paper 1966-6 (Columbus: Disaster Research Center, The Ohio State University, 1966), p. 6. (Mimeographed.) The basis of Yutzy's definition of community is derived from two major sources: Roland Warren, The Community in America (Chicago: Rand McNally and Company, 1963), p. 9; Christen T. Jonassen, "Community Typology," Community Structure and Analysis (New York: Thomas Y. Crowell Company, 1959), p. 20.
4. Yutzy, op. cit., p. 9.
5. Russell R. Dynes, Organized Behavior in Disaster: Analysis and Conceptualization (Columbus: College of Administrative Science, The Ohio State University, 1968), chap. ii.
6. Ibid.
7. Most of the material in this section has been adapted from two other authors. The adaptive model was initially formulated by E. L. Quarantelli in "Organization Under Stress," Symposium on Emergency Operations, ed. Robert C. Brietson (Santa Monica, California: System Development Corporation, 1966), pp. 3-19. The model was developed more extensively by Russell R. Dynes, op. cit., chaps. ii, iv. Dynes discusses the theoretical framework in much greater detail than is done here.
8. Dynes, loc. cit.
9. For further elaboration undertaken by the Disaster Research Center on the department of public works, see the following sources: On the Alaskan earthquake see David S. Adams, Emergency Actions and Disaster Reactions: Analysis of the Anchorage Public Works Department in the 1964 Alaskan Earthquake (Columbus: College of Administrative Science, The Ohio State University, 1968); on the St. Paul, Minnesota floods see John R. Brouillette, "The Bureaucratic Model of Organizational Analysis: Its Limits and an Alternate Position," a paper delivered at The Ohio Valley Sociological Society meetings at Notre Dame University, South Bend, Indiana, April 26, 1967; on the Cincinnati floods see William A. Anderson, "Some Observations on a Disaster Subculture: The Organizational Response of Cincinnati, Ohio, to the 1964 Flood," Research Note No. 6 (Columbus: Disaster Research Center, The Ohio State University, June 30, 1965); on

the Montana floods see Daniel Yutzy, "Authority, Jurisdiction and Technical Competence: Interorganizational Relationships at Great Falls, Montana, During the Flood of June 8-10, 1964," Research Report No. 10 (Columbus: Disaster Research Center, The Ohio State University, September 25, 1964); on the Chicago snowstorm see John R. Brouillette and James Ross, "Organizational Response to the Great Chicago Snowstorm of 1967," Research Report No. 21 (Columbus: Disaster Research Center, The Ohio State University, February 20, 1967). (The last three references are mimeographed.)

CHAPTER II

THE METROPOLITAN PUBLIC WORKS DEPARTMENT

Overview

In Chapter I we stated that the community oriented organizations are crucial in maintaining the community's basic functions. They are also the first to come to its aid when these basic functions are threatened. When the threat is a natural disaster, it is the emergency organizations -- which have both the community orientation and necessary resources -- that play the most active role.

City government is ultimately responsible for seeing to it that the daily processes are carried out effectively. The city uses different tactics to accomplish this end, the major one being that of incorporating the crucial organizations within the city governmental structure. For example, every city in the United States carries out certain functions such as police, fire, and public works. The majority of cities go beyond this, carrying out such additional functions as health, welfare, civil defense. . . .

Municipal government, however, does not incorporate all emergency organizations. For example, the American Red Cross and The Salvation Army are also important community emergency organizations, but are not units of city government. The city attempts to maintain a close working relationship with these organizations just in case it becomes necessary to coordinate their activities in an emergency situation. It is within this emergency organization complex that we will view the typical DPW. In this chapter we will focus on its normal or nondisaster responsibilities.

Personnel and Physical Resources

The average DPW would be characterized by its abundance of resources -- both human and physical. It is one of the city's largest organizations; in 1955 the average number of employees was 2.45 per thousand for a city of 250,000 to 500,000.¹ A typical DPW in a city of 500,000 would have approximately 12,250 employees, which is a large community organization by any criterion.

The department possesses many skills crucial to the orderly day-to-day functioning of the community. At the top is a core of highly trained professional engineers; below it are a number of skilled and semiskilled employees; while at the bottom there exists a pool of the relatively unskilled. Pooling its resources, we have a group of persons who are effectively able to design, construct, and maintain many of the vital services of the community such as streets, sewers, water lines, collection and disposal of garbage, and so on. Not only do these persons have appropriate skills for undertaking these activities, but also they have the capabilities to operate the physical equipment so essential in carrying out the various tasks. This leads us to a

discussion of another organizational resource -- physical resources.

Just as the department is characterized by its abundance of trained personnel, the same is true regarding its tremendous physical resources. In a modern metropolitan DPW, one can expect to find a city garage sufficiently outfitted to maintain all of the city's rolling stock. In addition, almost every city has its own garbage trucks, dump trucks, and snow plows. Where the city does all of its own construction, one would also find a crane, shovels, caterpillars, "cherry pickers," and other heavy equipment necessary for the construction and maintenance of roads, bridges, and the like. Quite often the city chooses not to do its own construction work, but rather to contract the work out to private contractors. In this case the DPW normally keeps up-to-date records of the heavy, private equipment available just in case an emergency situation arises requiring its use.

DPW's have another important resource -- a fairly well developed communication system, licensed under the public safety services portion of the Federal Communication Rules and Regulations. The system is characterized by the following: First, it does not rely solely on one means of communication; most DPW's utilize both telephone and radio. If one should be rendered unusable, communication would not cease. Second, the ability to communicate does not rest entirely on the availability of the city's electrical power. Gasoline-driven engines can provide power for the base stations. The department also maintains several direct phone lines, which do not go through electrically dependent switchboards. Third, its system is partially mobile, should movement of the communication capabilities be desired during the emergency. The base station, however, is not mobile. Fourth, the system is used in day-to-day routine activities of the department; this allows DPW employees time to become thoroughly familiar with the radio and gives the department officials a current check on the physical state of the equipment. Fifth, the department has the capability of communicating via both land-line and radio with certain other emergency organizations, such as the police, fire, civil defense, et cetera. All of these factors give the DPW an important communication potential in time of disaster.

The typical department might have several base radios located in a building with an antenna on top. A station might utilize electric power transmitted by the local electric utility company. As a backup in case of a community power failure, the station might also have a gas-driven generator to power the radio. A number of vehicles have mobile two-way radios in them, especially supervisors' and departmental trucks.

The departments generally use VHF or UHF frequency modulated (line-of-sight) transmission. Its primary advantage lies in the relative clearness of transmission without the interference commonly experienced on the average AM or broadcast-band radio. A disadvantage, however, exists because FM is limited to line-of-sight. For instance, one vehicle may have difficulty talking directly to another because a large building lies directly between them. This limitation is usually overcome, however, by transmitting first to the base station (which has its antenna on top of a building), which in turn transmits to the second vehicle.

In the daily operation of the DPW, the radio is very useful. Often segments of the organization are geographically dispersed throughout the community -- often not near a telephone. Situations arise during the day which require intercommunication between various segments of the organization. The two-way radio has proved to be an accurate and quite efficient mode.

A word about a third resource is necessary -- capital. Without sufficient capital, the necessary human and physical resources cannot be secured. A capital base is necessary. Every department has an annual operating budget which tends to vary greatly from city to city. In 1955, the range of operating budgets for twenty-five cities in different population groups varied from \$7.57 to \$31.10 per capita; the average was \$17.83 per capita.² DPW's in smaller cities have larger per capita operating budgets than do larger cities. Because the department is a public organization, it is only as rich as the community. If the community is poor, the DPW will also be poor.

A Multi-Purpose Organization

The typical DPW undertakes a variety of activities including:

Design, construction, and maintenance of streets, sidewalks, and sewerage systems; regulation of street openings; installation and maintenance of street name signs and traffic signs and signals; surveying and mapping; maintenance of motor vehicles, public buildings and off-street parking facilities; refuse collection and disposal operations; administration of construction contracts; review of subdivision plats; building inspection; and the operation of sewage treatment plants.³

A few number of cities design and construct water distribution systems and operate water treatment plants and pumping stations.

One of our purposes is to describe here the typical metropolitan DPW but, because the department's responsibilities differ greatly from city to city, our task becomes more difficult. This is a more serious problem than one encounters when studying many other organizations. For example, two police departments in different sections of the country may not be mirror images of each other, but they each have similar responsibilities. The same parallel can be made concerning city fire departments. But the assumption that organizations entitled "Department of Public Works" have similar responsibilities is certainly not warranted.

Cross-community comparisons of the department becomes very difficult. In the first place, many of the DPW responsibilities listed above might be carried out by any number of organizations -- the DPW, engineering department public service, streets and public improvements, department of streets and

sanitation, and many others. In the second place, even organizations with the same name may carry out vastly different activities. For example, in a comparison between St. Paul and Chicago, the latter's DPW is not responsible for streets, sanitation, or equipment service; these tasks are carried out by a completely separate department. Differently titled organizations often have overlapping responsibilities.

In order to circumvent this potential roadblock to our successful analysis, instead of focusing only on those organizations entitled "Department of Public Works," we shall concern ourselves with any public agency responsible for the public work's functions listed above -- regardless of the organization's official title. This approach will allow us to make observations about organizations which carry out similar activities. To simplify our discussion we will often refer to all of these organizations as DPW's even though in a given city the official designation of them may be the engineering department, streets and sanitation department. . . .

The functions of many DPW's are so vast that one might suggest that we consider a given department as being composed of many discrete units. Adams found in Anchorage that "the structure of the Public Works Department is perhaps best understood . . . less as an entity itself than as a comparatively loose federation of independent divisions."⁴ Often it may be useful to do just that. Several bureaus and divisions within the department often function quite autonomously in their daily activities. For example, the sewer bureau and bridge bureau may have little need to coordinate their activities, each dealing with a physically and functionally separate entity. Also many times the bureaus' responsibilities take them outside the organization to work closely with another department. This latter point will be discussed at greater length in Chapter IV, Interorganizational Relationships.

One must be careful, however, not to push the "autonomous unit" analogy too far. For in the final analysis, the bureaus and divisions are not separate organizations. A common tie among the units exists. "The common bond holding these multi-purpose activities together is that they all call -- in greater or lesser degree -- for engineers, technicians, and others who are engaged in what is frequently called building-trade occupations."⁵

There is still a more basic reason for not treating the subunits as separate organizations. The lines of authority from each unit eventually lead to the same person, the director of public works. Depending on his desire and the particular structure of the department, the DPW may function as a group of more or less autonomous units or as a single, closely knit organization. As Adams rightly points out, the DPW tends to lean more toward autonomy of parts in many cases. But the director of public works does have the authority and power to direct interaction among bureaus, and occasions often arise when coordination among bureaus is necessary. For example, everytime the bureau of sewers lays a sewer across a street, it must coordinate its activities with the bureau of streets.

Summarizing, we can say that the subunits of the department often function semiautonomously, but not as independently as separate organizations. This difference becomes more important in Chapter IV, where we will consider the department's structural adaptation to disasters.

A Monopoly

The DPW is a highly rational organization with a virtual monopoly over its environment with regard to the population served and the services rendered. These services are vital to the community so the department does not have to "sell its product." The department is part of the city government and has access to all of the city's resources; hence, it does not have to spend a great deal of time and energy legitimizing itself. In short, it can devote most of its energy to the technical problems of providing crucial services to the community, rather than having to worry about competition from other organizations, the securing of necessary resources, and the persuading of the population of the need for these services.

This is not to say that the department is completely free from all outside influence and able, therefore, to make all decisions irregardless of what the public wants. Indeed, the DPW is under considerable scrutiny by the public. But this pressure from the outside has greater consequences for individuals within the organization than for the organization itself. Individuals may be fired as a result of outside pressures but the DPW as such is not vulnerable. Its services are necessary; they may be modified but never extinguished. The department maintains a monopoly over its environment protected by legal charter and has at its disposal the monetary and physical resources of the community.

Bureaucratic Attributes

The typical DPW is highly bureaucratic.⁶ As used in the social sciences, this is a type of organization, not a condemnation referring to "red tape" and inefficient operation. Williams lists the main characteristics of this type of organization.⁷

1. There is, typically, an explicit definition of official activities considered to inhere in specific statuses; areas of authority and competence tend to be formally specified. .
2. There is a high degree of specialization of functions and duties.
3. Authority is inherent in the office rather than in the person.
4. There is a clear separation between "private" or personal activities and the activities carried out within the organization or in its name. For instance, the officeholder must spend his entire working time in the service of the organization. There is, furthermore, a sharp distinction between his personal

possessions and the goods of the organization; private budget and organizational budget are two different worlds.

5. The functioning of various offices within the organization is governed by generalized, abstract, but definite rules, which involve the categorizing of problems.
6. Procedure tends to be formal and impersonal, especially in dealings with superordinate and subordinate offices. Communications are recorded; forms of communication are stereotyped and ritualized; the intrusion of "personal" elements into the organizational activities tends to be discouraged.
7. In an ideal bureaucracy, the selection of all except the highest policy-determining officials is by appointment (rather than election, inheritance and so on) on the basis of technical competence.
8. Organization is hierarchical. Every office is a link in a chain of authority, and as a general rule, communications (orders, requests, information, etc.) pass through all the offices intermediate to the positions of the communicants.
9. The structure of offices is maintained by a relatively explicit and rigid discipline, as is shown by the imposition of various sanctions expected to encourage accuracy, caution, punctuality, methodical procedure, close coordination of activities.
10. A less essential but common characteristic of bureaucracy is provision for security of tenure among the officials -- promotion by seniority, annual-wage plans, pensions, and fixed-tenure provisions that hold in the absence of quite gross negligence or misconduct.
11. There is a frequently noted tendency to maintain a body of "secrets of the office"; many organizational details are closely guarded against observation by outsiders.

The DPW manifests many of these bureaucratic characteristics. First, within each department we find a specific division of labor. Each subunit of the organization has explicit responsibilities formally specified in writing. The following is a job description of a maintenance bureau of a large city's DPW:

This bureau is responsible for the repair and maintenance of all graded and paved streets and alleys, sewers, curbs, and sidewalks. It has charge of the city's asphalt plant. Miscellaneous force-account construction is assigned and it is their responsibility to complete the entire project. All of the lateral sewer connections from houses, apartment, commercial buildings, factories

and other structures to open cut sewers or sandrock tunnels must be inspected and records kept on actions taken. This bureau also inspects all street openings and moving of houses. The sewer maintenance division has charge of all sewer cleaning and minor sewer repairs. The sewer division is divided between sanitary sewer cleaning and maintenance and interceptor sewer cleaning and maintenance. All reports on complaints about faulty sewers and connections are checked out in this division.

The division of labor applies not only to the bureau level, but down to every last position within the department. For instance, the job description of the public works maintenance engineer is to be responsible for the maintenance, repair, and cleaning of all streets, alleys, sewers; and to perform related work as assigned by the assistant chief engineer. Examples of work to be performed are:

1. To be in charge of the maintenance, repair, and cleaning of paved and unpaved streets and alleys including snow plowing and removal.
2. To be in charge of the maintenance, repair and cleaning of sanitary, storm, interceptor and combination sewers.
3. To be in charge of the activities of the paving plant, the oil plant, and the public works garage.
4. To make estimates of costs.
5. To order supplies and material.
6. To supervise minor construction when done by city forces.

DPW personnel are appointed on the basis of technical qualifications, having to achieve a certain level on a civil service examination. In addition, many positions require the applicant to meet minimum training and educational requirements, as shown in the requirements for a maintenance engineer in one city.

College graduation and eight years' professional engineering experience, at least two years of which must have been as a Senior Maintenance Engineer. Must be a registered professional engineer in the state of _____ . /No substitution for education./

Types of Organizational Structure

The principle of hierarchy is closely adhered to by DPW's; each lower level is supervised by a higher one. The specific organizational structures differ greatly, however, from one department to another. There are three

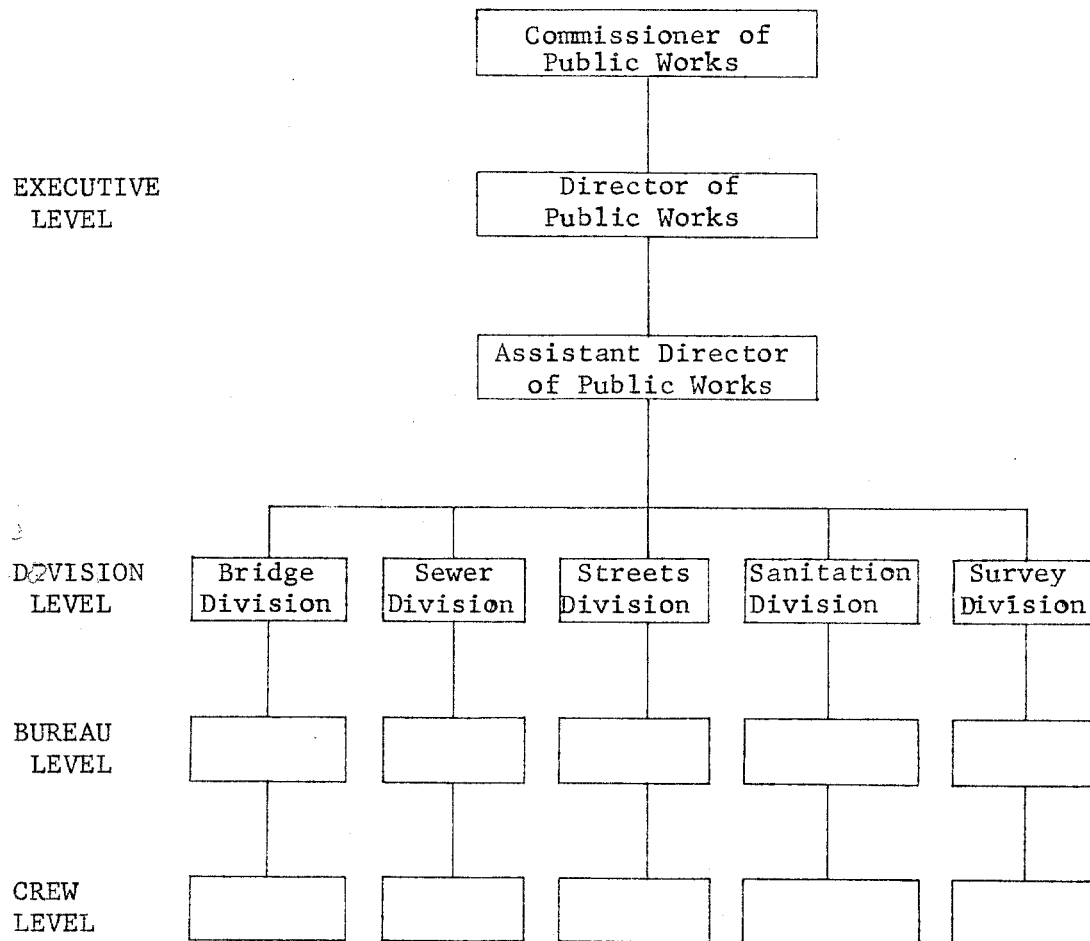


Figure 2. -- Organizational Chart of a Department of Public Works
Based on Tasks Performed

general types of structure based on (1) tasks, (2) functions, and (3) a combination of both tasks and functions.

The task type structure (often called the line type of organization) refers to a direct flow of authority from the director of public works to the division chiefs to the bureau chiefs and on to the workers. In its pure form, this type is presented in Figure 2. Although the chart probably does not represent any known department, it does show the lines of authority from top to bottom. Each division within the organization is quite self-sufficient concerning personnel and resources. Each division contains engineering, maintenance, and administrative personnel. For example, the head of the bureau of bridges is normally a registered professional engineer, as are some of his immediate subordinates; at the bureau and crew levels one finds numerous skilled and semiskilled maintenance personnel; and the administrative function is carried out by engineers themselves.

The task-type structure -- because each subunit contains engineering, maintenance, and administrative skills -- can function quite autonomously from the remainder of the organization. One can immediately see a major advantage of this type of structural arrangement in a disaster. Major emergencies often cut lines of communication, making it difficult for one segment of an organization to communicate with another. But with the task structure minimal communication is necessary for the successful performance of its responsibilities. A second potential advantage lies in the fact that engineer, maintenance, and administrative personnel are all in the same unit, maintaining a close working relationship with each other on a day-to-day basis. This may lead to fewer coordination problems during an emergency. More will be said on this advantage later.

We now turn our attention to a second major type of organizational structure based on function (often called the staff type organization). The staff type is planned with reference to the functions (engineering, maintenance, and administrative) to be performed. The pure functional type is presented in Figure 3. Like Figure 2, it is not intended to represent any given department. In our example, the commissioner of public works delegates more authority to each division. This type structure is designed to make the greatest use of expert knowledge. Specialists (engineering and general services) are placed between the commissioner and the maintenance division. This is a common arrangement where the quantity of work to be performed by an individual division or bureau is insufficient to keep a specialist adequately occupied, the benefits of specialization can frequently be achieved by employing such persons to serve the combined needs of all divisions of the department. With this type, the maintenance division and its bureaus are composed of maintenance personnel only. The engineering division provided the engineering skills for all bureaus. Normally a department needs fewer engineers in this type of organization. Similarly, it is often a much more efficient usage of personnel to combine other types of services into one central division. For example, centralized clerical help is often a much more efficient use of resources, than assigning secretaries to each bureau and not having enough work to keep them busy. In the same way, a DPW might establish

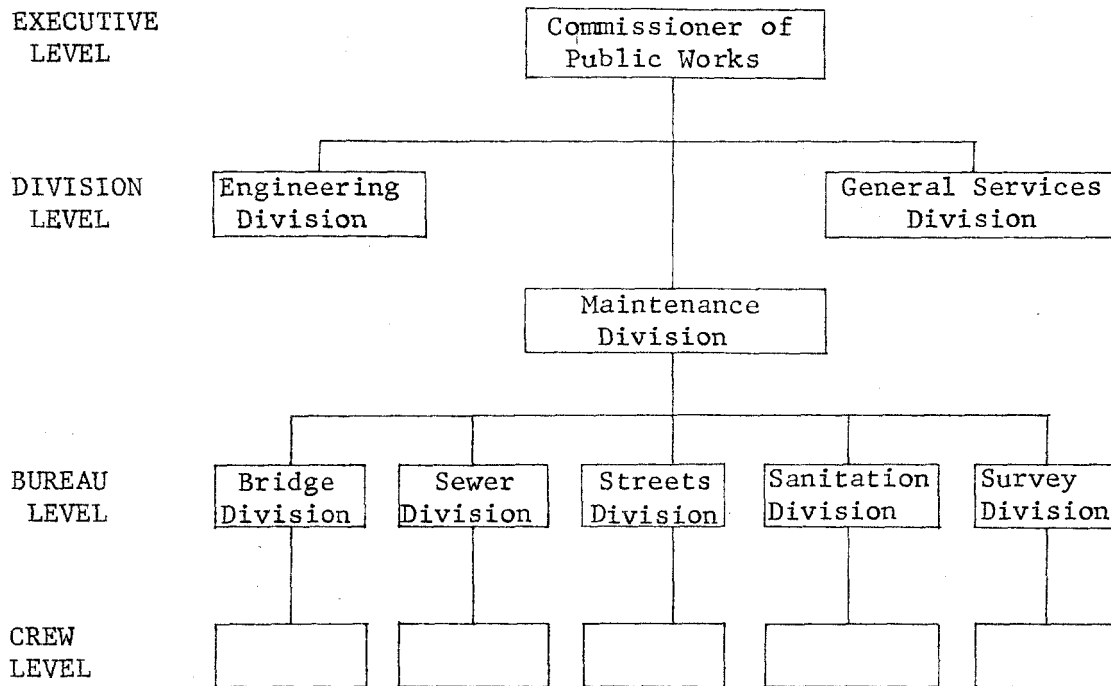


Figure 3. -- Organizational Chart of a Department of Public Works
Based on Functions Performed

a bureau of municipal equipment to service all of the department's rolling stock, regardless of which division or bureau uses it. In most cities, it would be very inefficient and costly for each bureau to have its own garage and maintenance personnel to service its vehicles.

The task and function types of organization are at the opposite ends of the continuum. Each has its advantages and disadvantages. Although, no DPW studied by the Disaster Research Center emulates either of these two polar types in the pure form, many lean toward one or the other. Most departments attempt to combine the advantages of both line and staff structure into their organization. Figure 4 shows a hypothetical structure based on both tasks and function. It is similar to the task- or line-type structure in that a direct line of authority exists from the director of public works through the engineering division down to the bureau and crew levels. In this particular case, we have combined certain engineering and maintenance skills into the engineering division. The bureau chief is a registered professional engineer, but many maintenance personnel are employed at the bureau and crew levels.

On the other hand, Figure 4 depicts elements of the staff or function type. For the sake of more efficient operation, separate divisions of administrative services and municipal equipment have been established to serve the needs of all bureaus within the engineering division.

Although Figure 4 presents elements of both task and function, it still leans toward the task- or line-type organization. The "heart" of the organization, the engineering division, remains a tightly knit task-type division. Each bureau, composed of both engineering and maintenance personnel, is still able to function somewhat autonomously.

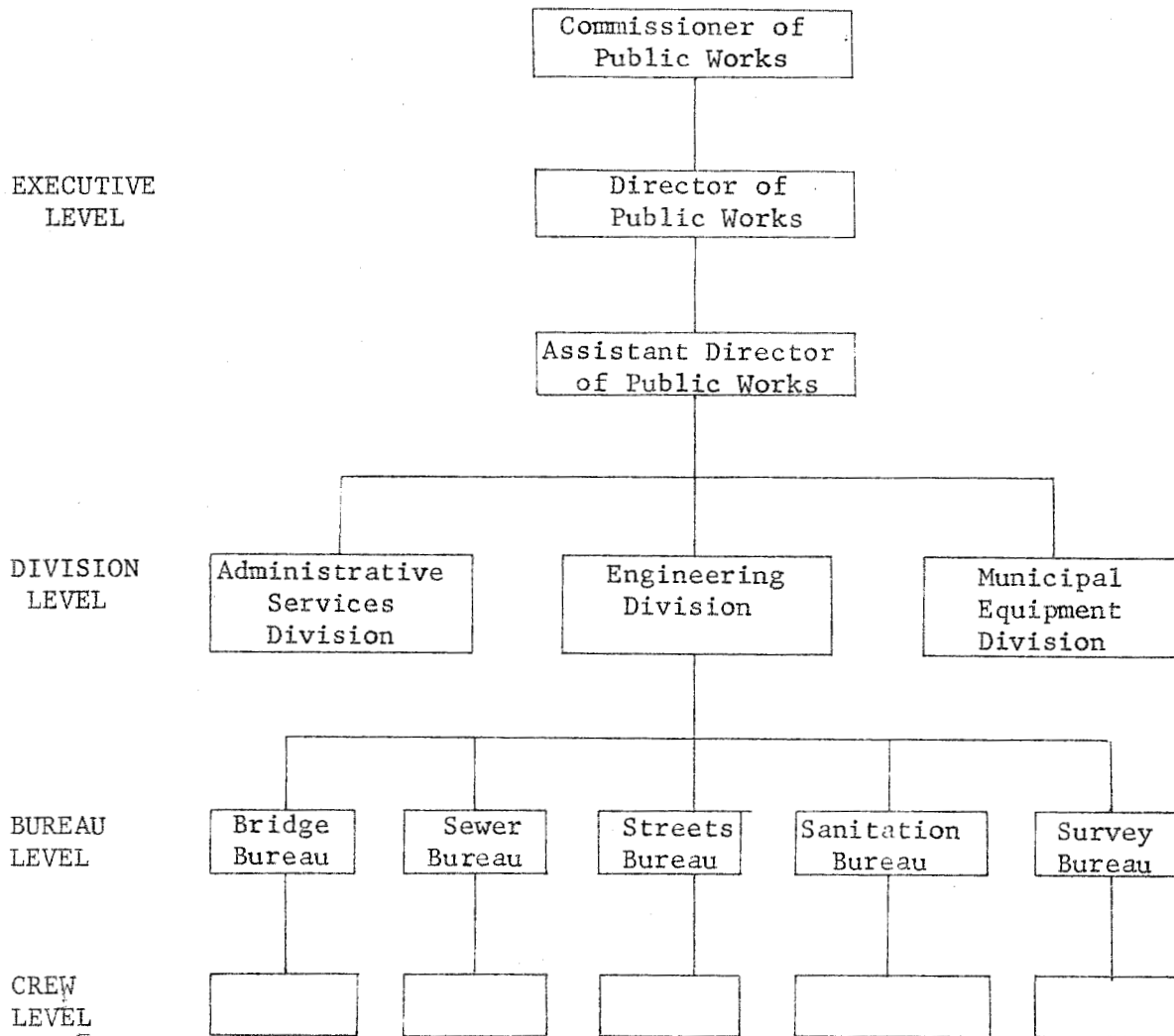
Other bureaucratic characteristics, an adequate intra-organization communication system and a precise reporting method is a necessity. These lead to efficient coordination among the subunits of the department.

No discussion of this subject would be complete without recognizing the fact that the success of any organization largely depends upon the extent to which the employees work together. Maximum coordination of inter-related activities can only be achieved if adequate lines of communication are maintained throughout the entire organization. This cannot be accomplished without the maintenance of a good record and reporting system.⁸

DPW's tend to develop formal channels of communication; written memos are the rule rather than the exception. Finally, records in all areas of planning and operation are kept.

We have described some of the bureaucratic attributes of a typical DPW. We could continue but to the same end. The organization appears to emulate

Figure 4. -- Organizational Chart of a Department of Public Works Based on a Combination of Both Tasks and Functions Performed



the bureaucratic type -- administrative machinery, detailed rules and regulations, hierarchical character, specialization, and impersonal orientation.

Potential Disaster Related Demands

Disaster Plan

Any event (imagined or real) which impairs or threatens to impair the DPW from carrying out any of its activities is a potential demand. In one sense, the DPW is a highly manifest emergency organization geared to adapt successfully to sudden and somewhat unexpected demands. It has an elaborate and practiced standard operating procedure for small emergencies, which gives it vital knowledge and experience for coping with major community disasters.

The plan is written and integrated within the department's standard operating procedure. It is geared to emergencies which have a reasonable possibility of occurring. For example, no one knows when a sewer or water line may break or plug up, but DPW officials are aware of the strong probability that this will occur from time to time in the life of every community. Therefore, the officials build into the organizational structure the capabilities of adapting -- to say, a broken water main -- quickly and effectively with a minimum of disruption to the community.

In a similar manner, DPW's in areas affected periodically by floods, hurricanes, or snowstorms build into their emergency plans methods of dealing with these contingencies. For example, departments in cities along rivers expect high water during certain seasons of the year and prepare accordingly. The officials know that they must shore up the flood walls to contain the water and to make sure that necessary openings in the wall (for example, sewers) are taken care of. No one knows exactly how high the crest will be or precisely when it will come, but the area floods often enough that DPW's prepare for it.

The department's continuous adaptation to relatively small periodic contingencies should help prepare it for major community disasters. We are not suggesting that their "practiced plan" is completely adequate to deal with major disasters, but rather that it is far ahead of other organizations which have no plan or only a "paper" (unpracticed) one.

Task Priorities

Earlier we listed typical responsibilities of the DPW. During normal times the department fulfills its duties satisfactorily. But when the demands placed on it reach a certain level, the department cannot adequately carry out all of its tasks; some must be deferred or dropped entirely. Most departments are fairly well agreed on which activities have top priority and which ones can be postponed temporarily. The Municipal Public Works Administration explicitly set down criteria for determining the relative importance of various public work's projects. In order of their relative importance, they are:

1. Protection of life
2. Maintenance of the public health
3. Protection of property
4. Conservation of resources
5. Maintenance of physical property
6. Provision of public services
7. Replacement of obsolete facilities
8. Reduction in operating costs
9. Public convenience and comfort
10. Recreational value
11. Economic value
12. Social, cultural, or esthetic value
13. Promotional value through effect on future developments
14. Relative value with respect to other services⁹

Anything then which threatens the valued ends of the community is a potential demand for whatever organization has the responsibility for the particular area involved or possesses skills crucial in meeting the demands. In our case, the DPW is responsible for carrying out certain functions or activities. For example, most departments are responsible for maintaining bridges throughout the city. If a structural defect in a bridge should occur threatening the safety (i.e., life and health) of motorists passing over it, the DPW would have the major responsibility of repairing the defect because life and health have top priority.

What types of disasters impose potential demands on the DPW? Because of their extremely diversified responsibilities, nearly all disaster events require the department to respond. For instance, a major function of every department is keeping the streets open and in a proper state of repair. Anything which renders streets impassable would constitute a potential demand on the department. Heavy snows which close the streets, tornadoes which dump debris on streets, high water causing streets to flood, or earthquakes actually breaking up the streets are all examples of potential demands posed by disasters. It is important for the DPW to keep the streets open if emergency vehicles of the police, fire, ambulance service, and others are to be able to rush resources to the impact area and transport the dead and injured away from it.

A second potential demand exists where a division of public works is responsible for the distribution of water to the community. First, water for human consumption must be kept potable. Second, it cannot be distributed without the aid of sufficient pressure (except in rare instances where gravity feed is possible). Any threat to clean water, water pressure, or any other aspect interfering with its use is a potential demand. The public relies on clean water every day; a minor interruption of potable water could cause severe inconvenience and possible threat to health. Also the city's fire department requires water under sufficient pressure to fight fires. Many disaster agents threaten the water distribution in some way. Earthquakes, hurricanes, tornadoes, explosions, and the like may break water lines (underground or on the surface) causing a loss of pressure and allowing contamination to enter the system.

Third, all DPW's are also responsible for maintaining the sewerage system -- disposing of the city's waste in an effective and efficient manner. Although an inoperative sewer system may not cause an immediate threat to life and property, no community can remain healthy for very long without adequate sewerage disposal. The orderly functioning of a community and its property are often threatened when the sewerage disposal system breaks down. For example, floods often pose severe problems for sewer divisions. When the water level is higher at the output or water pressure at the output becomes greater than it is throughout the rest of the system, the sewers fail to dispose of the sewerage. If not pumped, it either just sets there and does not drain or in more severe cases, reverses its flow and backs up. If the sewerage system is contaminated a health hazard is likely to develop. Even if the sewerage is not contaminated (as might be the case where we have an excessive amount of water from a flooding river), the large volume of water itself can disrupt daily patterns of living and destroy valuable property.

We could elaborate other potential demands for the department. For our purposes, however, the above examples should suffice in depicting some of the major types of demands expected frequently by the DPW in a disaster. We can summarize by saying that the organization is responsible for providing certain services for the community. Whenever any one of these is threatened, the organization is presented with a potential demand. Whether the department acts on these demands and how is the subject of the next two chapters.

FOOTNOTES: Chapter II

1. American Public Works Association, Municipal Public Works Organization, Public Works Engineers' Special Report No. 20 (Chicago: American Public Works Association, November, 1955), p. 10. A new edition of this book will appear shortly and present more updated figures.
2. Ibid.
3. Institute for Training in Municipal Administration, Municipal Public Works Administration (Chicago: The International City Managers' Association, 1957), p. 1.
4. David S. Adams, Emergency Actions and Disaster Reactions: Analysis of the Anchorage Public Works Department in the 1964 Alaskan Earthquake (Columbus: College of Administrative Science, The Ohio State University, 1968) chap. ii.
5. Institute for Training in Municipal Administration, op. cit., p. 2.
6. The original conceptualizations of the term bureaucracy is found in Max Weber, Wirtschaft und Gesellschaft (Tubingen: J. C. B. Mohr, 1922); Max Weber, Theory of Social and Economic Organization, trans. Talcott Parsons (London: William Hodge and Company, 1947).
7. Robin M. Williams, Jr., American Society: A Sociological Interpretation (2d ed. rev.; New York: Alfred A. Knopf, Inc., 1963), pp. 193-194.
8. American Public Works Association, op. cit., pp. 27-28.
9. Institute for Training in Municipal Administration, op. cit., pp. 31-32.

CHAPTER III

EMERGENCY TASKS

In Chapter II, we described the typical large city DPW in the United States and the potential demands it faces. The department's adaptation to an emergency will be the subject of this and the next chapter. Here we will focus on the nature of the tasks undertaken. Although at times we will refer to the subunits of the department, our primary concern is what the organization does as a whole. An attempt will be made to answer such questions as: What types of activities does the department undertake? Are they new or old tasks? When does the DPW become most heavily involved?

Here we are viewing the department's activities as an outsider would see them, describing the activities which this particular emergency organization undertakes in a disaster. In Chapter IV, "The Emergency Structure," the focus of our attention will be more on the internal dynamics of the organization.

Phases of Disaster

Disasters and the related community activity which surrounds them can be viewed as consisting of several stages. Powell, for instance, discusses the eight time stages of development of disasters, beginning with the pre-disaster conditions and ending with the recovery stage.¹ The stages and parallel community functions are presented in Figure 5. On the other hand, Dynes discusses the activities undertaken by various organizations and the relationship of these activities to subsequent community processes, as shown in Figure 6.²

Still other authors have concentrated more on one stage of disaster. For example, Williams focuses intensively on the warning phase of emergencies, which include the following steps:

1. Detection and measurement or estimation of changes in the environment which could result in a danger of one sort or another.
2. Collation and evaluation of the incoming information about environmental changes.
3. Decisions on who should be warned, about what danger, and in what way.
4. Transmission of a warning message, or messages, to those whom it has been decided to warn.
5. Interpretation of the warning message by recipients and action by the recipients.

FIGURE 5. -- Eight Stages of Natural Disasters Along a Time Dimension*

STAGE	FUNCTION
0. Pre-Disaster Conditions	Determining, to some degree, the affect of, and response to, impact
1. Warning	Precautionary activity
2. Threat	Survival activity
3. Impact	"Holding on"
4. Inventory	Diagnosis of situation and decision on action
5. Rescue	Spontaneous, local unorganized extrication and first aid, some preventive measures
6. Remedy	Organized and professional relief, medical care, preventive and security measures
7. Recovery	Individual rehabilitation and readjustment; community restoration of property and organization of preventive measures against recurrence

*John Walker Powell, An Introduction to the Natural History of Disaster (College Park, Maryland: University of Maryland, Disaster Research Project, June 30, 1954).

FIGURE 6. -- Disaster Activated Activities and Processes*

GROUP AND ORGANIZATIONAL ACTIVITIES	COMMUNITY PROCESSES
Accentuated by --	Generated by --
Group and Organizational Activities	Group and Organizational Activities
Warning	<u>Maintaining</u>
Preparing for impact	<u>Collecting and transmitting information</u>
-----IMPACT-----	Community order
Rescuing	<u>Controlling activities</u>
Caring for casualties	Group and organizational motivation and morale
Protecting against continuing threat	<u>Coordinating involvement</u>
Restoring minimum community services	
Caring for survivors	

*Russell R. Dynes, Organized Behavior in Disaster: Analysis and Conceptualization (Columbus, Ohio; College of Administrative Science, The Ohio State University, 1968), chap. v.

6. Feedback of information about the interpretation and actions of recipients to the issuers of warning messages.
7. New warnings, if possible and desirable, corrected in terms of responses to the first warning messages.³

The aforementioned show just a few of the many categorizations which some authors have found useful for describing the various stages of disasters. In the remainder of this chapter we will describe DPW activity as occurring in one of three time periods -- warning, emergency, and rehabilitation.

Warning Phase

The onset of warning begins whenever the community starts receiving cues that a disaster agent threatens to strike in the not too distant future. In many types of disasters, the warning period is extremely short or nonexistent so as to preclude remedial action on the part of organizations. Such would be the case with earthquakes, explosions, flash floods, and quite often tornadoes.

Often, however, other types of natural disaster agents do give cues which may be acted upon to ready the organization and community for impact. The length of warning varies from disaster to disaster, from a few minutes to several weeks. Examples of this type would include tornadoes detected early, hurricanes, slowly rising floods, forest fires, snowstorms, and tidal waves. Warnings preceding a tornado, for instance, may range from only a few seconds up to an hour before impact. At the other extreme, a community may be aware of approaching floods several weeks in advance.

Many emergency organizations are heavily involved during the pre-emergency or warning period. For some agencies, such as the U.S. Weather Bureau, this phase is more stressful than the post-impact period. But other emergency organizations, with their community orientation, are also very busy during the warning phase. Several distinct categories of activity take place during this period including (1) warning dissemination, (2) notification and mobilization of organizational personnel and readying resources, (3) protecting persons and equipment against the effects of the disaster agent, and (4) averting the disaster agent itself.

Warning Dissemination

The DPW does not normally become involved in disseminating warnings of threat of a disaster. Two major exceptions, however, should be mentioned. In one instance studied, the department did work closely with the weather bureau and Army Corps of Engineers to predict the ultimate crest of rivers and streams during potential flooding. The DPW survey bureau constantly measured the water level in periods of rising water, which it in turn used (with other criteria such as temperature, soil conditions, etc.) to predict what level the river would reach for different time periods. Coupled with this information, all engineering departments maintain up-to-date topographical maps of the city. With these maps and a knowledge of future flood

levels at certain points throughout the city, the department was able to predict what land would be inundated and approximately when. This information was then passed on to enable the public to take appropriate precaution. Similarly, prior to the prediction of heavy snows, the department with information supplied by its private meteorologist, initiated warnings to the populous telling them not to drive on major thoroughfares after 4:00 p.m.

Notification and Mobilization of Organization Personnel and Readying Resources

While the DPW does not accept the role of a major warning-dissemination agency, it is extremely active during this period, alerting its own personnel and taking stock of its resources. In general, the department encounters very few problems in mobilizing its members, being able to amass an organized effort in a very short period of time. There are two major reasons for this. First, the department normally has a 24-hour skeleton staff on duty during periods of high probability of a disaster occurring, and, second, all personnel are thoroughly familiar with the emergency sections of the standard operating procedure which delineate methods of mobilizing. The department's members are always on standby and have been indoctrinated to report in if they should "pick up" cues of an impending disaster.

But mobilizing personnel is only one step in preparing the department for a disaster. If the DPW is to be most effective during the emergency period, it must take stock of its equipment and resources. A sufficiently long warning period should allow the department to resupply depleted items or to make arrangements with other organizations to coordinate their activities during the emergency period. For example, in a recent flood, department officials predicted they would need a large number of flashlights, batteries, raincoats, and life-jackets. All of these items were secured from local retail establishments prior to extensive flooding. In general, where the DPW finds itself insufficiently prepared for its potential emergency responsibilities, it takes steps to secure needed resources, both physical and personnel.

Protecting Persons and Equipment Against the Effects of the Disaster Agent

Man has been unable to avert most natural disaster agents, including earthquakes, many explosions and fires, hurricanes, tornadoes, et cetera. Even in those which may give some warning -- hurricanes and some tornadoes -- emergency community organizations have been unable to alter their course. There has been some experimentation dealing with the possibility of actually breaking up hurricanes and tornadoes before impact, but as of the present time, no weather modification program of this sort has been implemented. The only precautions that the organizations can take is to protect people and material from the agent itself.

The DPW has two responsibilities in this regard. First, it is responsible for carrying out certain activities on the community level -- concerning both the general populace and public facilities. Often it is in charge of evacuating persons from potential flooding. For example, in Great Falls, Montana, the city engineer was in charge of evacuating residents and their household furnishings from endangered sections of the city. With regard to

public facilities where wind is a factor, the DPW is normally responsible for tying down traffic controls and signs and for placing sheets of plywood or other protective material over the windows of public buildings.

Its second major responsibility is that of securing its own personnel and equipment from the disaster agent. Examples of the latter include that of putting all of their vehicles and other equipment inside buildings and tying down or covering everything else which can't be brought inside. In this way the organization's capabilities will not be lessened when it must move into the impact area after the disaster agent passes.

Averting the Disaster Agent

There are a few instances where knowledge is available on how to deter the disaster agent itself -- in controlling floods, some forest fires, and some explosions. The DPW becomes most active during slowly rising floods. The major difference between the DPW's activity prior to a flood and its activity prior to impact of a hurricane, stems from the fact that in the latter case, the organization attempts to lessen the deleterious effects of the hurricane on the community, while in the former, the department attempts to keep the agent itself (high water) from striking the community.

The DPW, sometimes in conjunction with the Army Corps of Engineers, often has the responsibility of flood control. This task occupies the major part of the organization's time and energy. Its activities involve insuring that the levees and floodwalls are materially sound and sufficiently high to contain the flood waters. Also a functioning sewerage system must be maintained. During normal periods, most sewers operate on the gravity-feed principle, but when flooding water rises higher than the sewer outlets, the sewerage must be lifted or pumped into the river. All DPW's in charge of flood control have emergency plans sufficient to cope with most seasonal rises in water level of adjacent rivers and streams. The plans indicate in detail precisely what actions must be taken at various levels of the river.

But when the predicted rise is much greater than that planned for, the department may have a great number of extra tasks to perform in a limited time. Such was the case in St. Paul where the weather bureau predicted a flood of the magnitude with a probability of occurring once in 300 years. If the water reached to predicted height, it would overflow the floodwalls and dikes flooding many homes, private businesses, and factories. The bridge engineer, working at "break-neck" speed, designed and supervised the construction of a plywood extension on the permanent floodwall.

We have discussed a few, but by no means all, of the pre-disaster activities undertaken by the DPW. It can be seen that warning-period responsibilities fall into at least four types, each involving a different response by the department. In any given warning period, it may be involved in one, two, three or all four types of tasks. To illustrate, we have included a list of tasks undertaken by a DPW in several recent hurricanes. Although its activities are presented in a plan depicting what should be done, the department has actually followed it quite closely in the past. Therefore,

it provides us with an example of what was done.

Phase I Pre-Emergency or Preparatory Activities

Upon announcement that an actual or impending natural disaster is in effect for a hurricane, flood or other emergency condition involving abnormally high water, the Water Control Division will implement its "SOP for Utilization of Amphibious Type Vehicles /DUKW's/ in Rescue Operations."

1. Secure equipment and materials against hurricane winds at the site of work projects not under contract to outside agencies.
2. Tie down or otherwise secure traffic control devices and signs to minimize damage during hurricanes.
3. Organize damage survey teams as required.
4. Designate and equip emergency standby repair crews.
5. Place standby emergency generators in operational readiness.
6. If flooding conditions are anticipated, place amphibious vehicles /DUKW's/ on standby to provide rescue services.
7. Provide work crews, necessary equipment and material to secure against hurricane winds those county facilities for which the Public Works Department is responsible.

Emergency Phase

The major data collected by the Disaster Research Center pertain to the emergency, rather than warning or rehabilitation phase of disasters. This period commences with impact and ends when the most important community values (life, health, property, etc.), with which the department deals, are no longer in serious jeopardy. With the major exception just discussed in warning period, most DPW's become most heavily involved after impact and remain so until well into the rehabilitation phase.

We have found that the DPW follows quite closely the priorities set down by the Municipal Public Works Administration -- protection of life, maintenance of public health, protection of property, . . . Secondary disasters -- live wires on the ground, leaking gas, injured persons who will die if not treated soon, etc. -- often pose the most immediate threat to the community's valued ends.

An official related some of the activities which his department undertook during the first few days following the Alaskan earthquake. Note how closely the activities actually parallel the DPW criteria for determining priorities.

A. Immediately:

1. Set up communications.
2. Attempted to restore water to a major hospital.
3. Rounded up civil defense hospital supplies for the gym.
4. Checked buildings for bodies and injuries.
5. Barricaded area to sightseers.
6. Cleared main streets of debris.
7. Still didn't bother very much with sewers, rather in restoring water.

B. Next Day:

1. Set up teams of architects and engineers to check out all buildings for a safety hazard.
2. Started making provisions for sanitary facilities such as cans, especially in areas without water and sewer service.
3. Garbage trucks filled in the streets so fire trucks could get through.

C. Later:

1. Sent out teams to pick up all spoiled food.

In a similar manner, department personnel tend to engage in the top priority items first. Initially the most frequent DPW task was to clear debris from vital transportation arteries within the city. Hurricanes, tornadoes, earthquakes, explosions, snowstorms often strew debris on streets making it difficult, if not impossible, for emergency vehicles to get through -- fire trucks to fight fires, ambulances and other vehicles to carry the injured to hospitals, and search-and-rescue personnel from numerous organizations to search the wreckage for the dead and injured.

The DPW is generally better prepared than any other organization with regard to both skill and resources to clear debris from the streets. And this is exactly what it undertakes in the early stages of many emergencies. This is not a new task for the department; its normal tasks involve maintenance and repair of streets. The heavy equipment which they operate in normal times is of great utility during many varied types of disasters, as the following examples show. Immediately after impact of the 1953 Worcester tornado, DPW officials "dispatched crews to the area with bulldozers, chain saws, and other heavy equipment, to clear the roads" so rescue vehicles could get to and from the impact area. Within an hour and a half a one-way passage through the rubble had been cleared.⁴

In another instance after a dam break outside Baldwin Hills, California, a thick residue of mud was deposited on the streets making it impossible for traffic to get through.

The Street Cleaning Section, . . . ordered in elements of the night street cleaning crews, which had the capabilities for coping with the mud removal problems. Their mission was to continue to open streets so that emergency traffic could pass through.

.
. . . The resources of the Street Maintenance Division . . . were concentrated on cleanup work. Day units of the Street Cleaning Section and a resurfacing crew with heavy equipment moved in to assist. Motor graders were used to move the mud and debris from the gutter areas towards the center of the roadways so that it would dry out and drainage would flow in the gutters.⁵

During heavy snowfalls, the division of streets inevitably becomes involved in clearing streets of snow. The recent Chicago snowstorm in 1967 showed the heavy involvement of the streets and sanitation department in the emergency. Thirteen to twenty-five teams were out on the streets attempting to clear them. A typical team was composed of two or three supervisors, four trucks, two plows, one high lift, one electric truck, and two patrol cars (the latter from the police department).

Although debris clearance tends to be one of the department's most frequent tasks during the early stages of an emergency, it is by no means the only one. When a community suffers a power outage, for instance, the DPW is often called upon to furnish auxiliary power for critical points. For example, during the Eastern power outage on November 9, 1965, the DPW in Pittsfield, Massachusetts, secured auxiliary power in order to pump gasoline for the city's emergency vehicles.

One of the problems involved was gasoline for the city vehicles, including police and fire, which is furnished through the Public Works Division. In about an hour after notice was given, we had emergency power connected at our city yard and at our Sanitation Division which allowed us to provide gas.⁶

The outage also affected West Hartford, Connecticut. There the DPW supplied the town hall with an emergency generator which provided auxiliary power for its fire control system and police radio.⁷

Another activity which the DPW commonly becomes engaged in is restoration and maintenance of the water supply. Often this involves making temporary repairs early in the emergency period. Restoring water to hospitals and fire departments has first priority. In Anchorage, Alaska, water crews automatically started trying to get water back to a major hospital which was called upon to treat a number of the injured. Similarly, during the Coyote forest fire outside Santa Barbara, California, maintaining adequate water pressure was the first concern of the water utility.

There is one other emergency task in which the organization sometimes

becomes involved, but for only a short time and only in major community disasters -- that of search and rescue. This new task for the DPW is sometimes undertaken by the department alone, but more generally in cooperation with other organizations. Worcester, Massachusetts is a case in point. Early in the emergency period the department together with the police and fire departments conducted the main rescue and evacuation operation. The DPW with 50 of its personnel operated two civil defense trucks freeing all casualties within thirty hours. During the first two hours after impact:

. . . standard community protective agencies /police,
fire, and public works departments personnel/ were, with
the assistance of a large number of volunteers who entered
through the filter area, and with the aid of victims them-
selves /who seem to have been stimulated to greater activ-
ity by the arrival of uniformed outside aid/, able to (a) -
neutralize secondary impact /fires, gas leaks, live wires/;
(b) give extensive, if crude first aid; (c) rescue from
entrapment all living trapped victims; (d) evacuate to hos-
pitals all seriously injured persons.⁸

In Anchorage, following the earthquake, public works employees engaged in search-and-rescue activities, although not so much as part of the department itself. Rather members of the building construction and maintenance section organized a search-and-rescue team because no other group in the city had done so.⁹ More will be said about this relatively unique DPW task in the next chapter.

These are a few of the most common emergency functions undertaken by the DPW. In any given large community disaster, its emergency functions may be narrowed or expanded. Some departments find themselves engaged in emergency restoration of electric power, maintaining sewerage systems, traffic control, or repairing airport facilities. One DPW in a Florida county which periodically experiences hurricanes has been assigned by civil defense the following tasks in the immediate post-impact period. Again, it has been included here not because it is a plan, but because the department has carried out these activities during the past emergency periods.

Phase II Immediate Emergency Function

1. Make emergency repairs to essential facilities, as required.
2. Provide auxiliary electrical power to critical county-owned installations, as required.
3. Inform Civil Defense Director of estimated or known damages and emergency actions being taken.
4. If required, dispatch emergency crews to clear debris blocking critical emergency vehicle routes.

5. Provide amphibious vehicles /DUKW's/ to assist in evacuation of persons from flooded areas, as required.

When the DPW has coped successfully with its responsibilities geared to protect the community's most valued ends, the emergency phase is over for it.¹⁰ Other organizations may still be in a state of emergency, but for the DPW, the period of rehabilitation begins.

Rehabilitation Phase

Although most data collected by the Disaster Research Center pertains primarily to the emergency, sufficient information has been gathered on the rehabilitation phase to give a brief description of the general activities engaged in by the DPW. With the advent of this stage the organization can "take a breather." No longer is the organization's total energy devoted to the top priority activities of saving "life and limb." A portion of the organization can return to a more normal state, dealing with many of the lower priority items which were temporarily set aside during the emergency. The organization has by no means returned to its normal state, however. Segments of the organization which return to regular pre-emergency activities are busier than ever trying to take care of the backlog of routine tasks; the rest of the organization still must carry out many disaster-related tasks before the organization can return to normal.

Many of the activities carried out in the emergency period were done very hurriedly in a makeshift, temporary fashion. Many of the repairs would not be sufficient for permanent installation. For example, in Anchorage, faults in the road were filled with gravel in order to make temporary passage possible, but a road with this type of emergency repair would certainly not hold up indefinitely. In another instance, water mains had been severed by the same earthquake; therefore, hoses had to be run above ground to carry water to a large hospital. The hoses could not be left above ground indefinitely, however. Likewise, only buildings which posed an immediate threat to the individuals were torn down, leaving more meticulous inspection of others until later. Finally, debris from the streets was merely pushed aside, later having to be removed from the scene. All of these are examples of temporary restoration and would not allow segments of the community to function normally.

It is during the rehabilitation phase that the organization must reassess the situation and determine what it must do to help the community get permanently back on its feet, and this includes going back over many of the temporary repairs and making them more permanent. Many engineering problems normally arise during this phase requiring the skills of various engineering personnel within the department. The third phase of a Florida county disaster plan shows activities undertaken in previous hurricanes during the early stages of the rehabilitation phase.

Phase III Post-Emergency Recovery or Cleanup

1. Complete emergency repairs to county-owned buildings, roads, bridges, traffic control devices, and other public facilities.
2. Provide auxiliary electrical power to county-owned installations on a priority basis, as required.
3. Expedite clearance of all public streets, roads, and right of ways, and removal of debris in unincorporated areas of the county.
4. Conduct surveys of damages to county-owned facilities and submit report to CD Director.
5. Provide additional transportation, as required and available, to assist other county agencies in the recovery effort.
6. Maintain records on cost of materials, labor and contracted services, over and above normal operating required to effect emergency repairs and restore normal operations. This data will be required to justify claims under Public Law 875 in the event _____ County is declared a disaster area.

Concluding Remarks

Thus far we have not differentiated between maintenance and engineering personnel; a few comments are warranted. Major community disasters point to some differences between the two types. First, maintenance personnel generally become involved very early in the emergency period. They possess the skills necessary to divert a possible secondary disaster. Also they are used to operate the heavy equipment so often required in order to carry out top-priority tasks. Adams found that there was a continuity of tasks for maintenance personnel from normal to the emergency phase following the Alaskan earthquake.¹¹ The primary difference for them during the emergency being a large increase in work rather than new tasks. A foreman related the following: "We've been through the same thing many, many times. . . . It was just bigger and lasted longer and everybody worked a lot harder."

Engineers, on the other hand, present a slightly different picture. They often become involved in the disaster later than do maintenance personnel. Sometimes they take on new tasks, but for only a short period of time. For example, after the Alaskan earthquake, the design section became involved in transporting medical supplies to one of the Anchorage hospitals. Quite often their normal tasks are not called for during the emergency phase; therefore they either remain idle, or more often, adapt to a slightly new situation.

In general, the greater the community disruption, the less the continuity of tasks among engineers. However, the amount of disruption seems to have relatively little effect on maintenance personnel. In less devastating community disasters, there tends to be continuity of tasks for both types of personnel. The department is very reluctant to take on new tasks in any but the most pressing situations. It should not be assumed, however, that the department undergoes little or no structural change. Often, as we shall see in Chapter IV, the department undergoes dramatic changes in structure in order to cope with the emergency.

In this chapter, we have described the nature of tasks undertaken by the DPW during the warning, emergency, and rehabilitation phases, respectively. Second, maintenance personnel tended to become involved in disaster-related activities earlier than did engineers. This was especially true in emergencies which gave no warning. Third, continuity of tasks was a more common phenomenon than discontinuity, although occasionally the engineers displayed less continuity than maintenance personnel. This leads us to conclude that the DPW adapts to emergencies with either a Type I or Type II response, i.e., regular tasks being undertaken by an old or new structure, respectively.

It should be reiterated that we have been focusing on the organization as a whole, and have found departments reluctant to take on new tasks. Individual members within the DPW, however, may be shifted to tasks far different than they are used to. For example, during a recent flood two persons were assigned the job of securing all disaster supplies, a completely new task to them. But as we will see in the next chapter, this was basically a structural change. Many changes in individual tasks occur in community disasters; these do not, however, repudiate our finding that continuity of activities for the organization as a whole is the rule rather than the exception. We shall turn now to Chapter IV in an attempt to ascertain the nature of the department's emergency structure.

FOOTNOTES: Chapter III

1. John Walker Powell, An Introduction to the Natural History of Disaster (College Park, Maryland: Disaster Research Project, University of Maryland, June 30, 1954).
2. Russell R. Dynes, Organized Behavior in Disaster: Analysis and Conceptualization (Columbus: College of Administrative Science, The Ohio State University, 1968), chap. v.
3. Harry B. Williams, "Human Factors in Warning-and-Response Systems," The Threat of Impending Disaster: Contributions to the Psychology of Stress, ed. George H. Grosser, Henry Welcher, and Milton Greenblat (Cambridge, Massachusetts: The Massachusetts Institute of Technology Press, 1964), pp. 82-83.
4. Anthony F. C. Wallace, Tornado in Worcester: An Exploratory Study of Individual and Community Behavior in an Extreme Situation, Disaster Study No. 3, Publication 392 (Washington, D.C.: Committee on Disaster Studies, National Academy of Sciences-National Research Council, 1956), p. 78.
5. Ben R. Paris, Director, Bureau of Street Maintenance, Los Angeles, California Department of Public Works, "Aftermath of an Emergency," Public Works (May, 1964), pp. 103-106.
6. John F. Daniels, Commissioner of Public Works, Pittsfield, Massachusetts, "Power Outage Effects in Water and Sewage Facilities," Public Works (January, 1966), p. 85.
7. T. M. Nosek, Director of Public Works, West Hartford, Connecticut, "Power Outage Effects on Water and Sewerage Facilities," Public Works (January, 1966), p. 86.
8. Wallace, op. cit., pp. 79-80.
9. David S. Adams, Emergency Actions and Disaster Reactions: Analysis of the Anchorage Public Works Department in the 1964 Alaskan Earthquake (Columbus: College of Administrative Science, The Ohio State University, 1968), chap. iv.
10. This is not to imply that all subunits of the department pass through the emergency phase simultaneously. In fact this is the exception rather than the rule. For example, the office staff often returns to a more normal state earlier than, say, the maintenance bureau.
11. Adams, loc. cit.

CHAPTER IV

EMERGENCY STRUCTURE

We have seen the department attempt to carry out tasks for which it was responsible. By and large, continuity of tasks does exist between normal or nonemergency times and community disasters. The major exception was DPW involvement in rescue operations, but in at least one instance in Florida, even this task was pre-assigned to them and specifically stated in the disaster plan. In essence, what is most notable about the department is the continuity of tasks from nonemergency to emergency periods.

The next logical question might be, "Does this mean that the organization, for all practical purposes, does not change when confronted with an emergency?" To answer this question merely on the basis of its task performance, we would have to say that the DPW changed very little during the great bulk of natural community disasters in the United States. But tasks are only one component of an organization capable of change. To answer the question more completely, we must first look at another component of the organization -- its structure; and relationships among various departments, among divisions, and among positions. It is quite possible for an organization to maintain a continuity of tasks with a much changed structure.

Levels of Organizational Demand

The DPW is potentially faced with differing levels of demands, from normal to very heightened. In this section, we will focus on the nature of the organization's structure at the various levels, noting any changes which took place. Let us consider the department's adaptation to four different demand levels: (1) normal periods; (2) anticipated seasonal or periodic emergencies; (3) unanticipated emergencies in which the department continues to carry out pre-emergency-defined responsibilities; (4) major unanticipated emergencies in which the department undertakes entirely new tasks.

LEVEL I: Normal Periods

In normal periods the community's valued functions are not threatened. The DPW is able to cope with any situation utilizing its normal structure when carrying out its responsibilities or tasks. Using its bureaucratic structure it is able to meet the day-to-day fluctuations in the environment for which it is responsible. The structure which we described in Chapter I is more than adequate to repair a broken water main or sewer line with very minor inconvenience to the community. The organization expects these minor emergencies and builds into its structure methods of handling them. At this level, the DPW adapts with a Type I response (normal structure and regular tasks).

LEVEL II: Anticipated Periodic Emergencies

Communities in certain sections of the country experience recurrent emergencies which pose a somewhat greater threat to normal community functioning, and, hence, present more demands upon the DPW than normal. For example, some cities lying on rivers are subjected to floods every spring; communities on the Gulf and Atlantic coasts often experience hurricanes; towns and cities in "tornado alley" (Texas, Oklahoma, Kansas, Arkansas, etc.) experience the threat of a large number of tornadoes each year; certain northern cities in the snow belt are subject to heavy storms during the winter months. The disaster agent threatens the areas often enough for the DPW to know what general demands will be made on it. DPW's attempt to build onto their emergency operating procedures methods of adapting to these periodic community emergencies. Each organization develops standard operating procedures and technical skills for coping with the emergency. Although living in an area periodically threatened by floods, hurricanes, tornadoes, forest fires, etc. does not automatically assure greater efficiency, it has been our experience that the organizations in these areas actually do perform more effectively and efficiently than organizations which function in a different environment.

Organizations do learn from past emergencies. For instance, in Cincinnati, the DPW in conjunction with police, fire, and Red Cross established detailed procedures to lessen disruption to the city's functioning caused by extensive flooding. The department was able to shift from its normal to emergency activities with minimum disruption to itself and the community at large. It was able to fulfill all of its functional priorities with little, if any, unanticipated change in the patterned or structured relationships existing within the organization. For example, there was little change in decision-making lines of authority, or communication patterns. Because the DPW did not encounter any unusual problems, there was no disaster; the organization carried out its regular tasks utilizing its normal or bureaucratic structure (Type I response).

To the layman viewing vast flooded areas of Cincinnati on TV, it would certainly appear to be a disaster. It might be difficult to understand how such extensive flooding could not severely disrupt the normal functioning of the community and its emergency organizations. Such is the case, however. Where certain types of disasters periodically occur, the community in general as well as individual organizations learn to adapt very effectively with minor disruption to the community's valued functions. For example, extensive traffic jams often occur in major community disasters which involve flooding. But in Cincinnati, no such traffic tie-ups existed; the populace and organizations alike having experienced floods before knew which streets would be closed and, therefore, did not attempt to use them.

To describe community adaptation to recurrent threats, Moore originated the concept, "disaster culture," which includes:

. . . those adjustments, actual and potential psychological and physical, which are used by the residents of such areas in their efforts to cope with disasters

which have struck or which tradition indicates may strike in the future.¹

It is quite a useful concept referring to the norms, values, knowledge, and technology which develops over time in a disaster-prone area and which is brought into being during a specific emergency. Although the concept could be applied to both individual and organizational level responses, we are more interested in the latter. Also the concept has relevance on the emotional, perceptive, and behavioral levels; we will focus on behavior exhibited by organizations.

Disaster subcultures are normally highly specific referring to flood, hurricane, or tornado subculture. For example, Cincinnati could be considered a flood subculture in that the city's organizations have incorporated into their operating procedures ways of adapting to floods. But if the city should be hit by a tornado, the norms, values, knowledge, and technology may not apply. In other words, the city might have effective means of coping with one type of disaster agent and still be ill-prepared for another.

We have sent teams to several disaster subcultures on the basis of initial reports of widespread destruction of property, injuries, etc. In many of these instances we have found that the DPW and other emergency organizations experienced no stress. In each case, they were able to fulfill their responsibilities using their standard operating procedures. Upon returning from many such reconnaissance trips, our conclusion was the same: Despite widespread physical damage, the stress and resultant structural change exhibited by the major emergency organizations within the community was not judged to be of sufficient intensity or scope for a major in-depth study.

It should be mentioned, however, that no disaster subculture and the resultant organizational pre-planning implied can guarantee that any given organization will be able to anticipate every contingency it faces without changing its structure. If the water had been 10 feet higher in Cincinnati, the situation might have been entirely different. Many of the community emergencies we have studied do place greater demands on the DPW than it can handle relying on normal and pre-planned emergency procedures. It is this type of organizational emergency to which we now turn our attention.

LEVEL III: Unanticipated Disaster I

Sometimes disaster agents cause or threaten to cause sufficiently severe disruption to community functioning that organizations responsible for coping with the emergency cannot, at least with their standard operating procedure, meet the demands. The demands are either of sufficiently different quality or so greatly increased that prior disaster plans, if they exist, are not adequate to cope with the situation. The organizations must establish new routines and patterns or possibly secure additional resources in an attempt to adapt to this new, unanticipated disaster. The DPW, like other organizations, has often reached this level in finding that it must change its structure in order to cope with new or increased demands. At Level III, the

department adapts to the emergency with a changed structure, but continues to carry out old, familiar tasks (Type II response).

All of the disaster-related demands fall into at least one of the emergency organization's domains, therefore, none are forced to take on new tasks or expand their domains. No crucial task has been left unattended. To put it differently, some of the community's valued ends may be threatened, but all critical tasks are being undertaken by at least one group. Hence, the DPW is able to carry out familiar tasks rather than adapt to entirely new ones. Only in the most severe community disasters (Level IV) are emergency organizations forced to expand their domains and engage in new activities.

No community or organization is immune to every contingency which a natural disaster presents to it. For example, the flooding which occurred in Cincinnati in 1964 posed no unanticipated problems for the DPW, but a physically similar situation in Denver, which is not in a flood subculture, did. Similarly, if the flood crest had been 10 feet higher in Cincinnati or the city hit by a major explosion, the DPW may not have been able to cope successfully with the demands without a change in the organization's structure. So we see that it is not the disaster agent and the resultant physical damage per se which forces the department to change its structure, but rather a combination of the physical disaster and the organization's state of preparedness with regard to that type of emergency.

The Disaster Research Center recently studied a large metropolitan DPW engineering department's adaptation to the threat of flooding. The community had developed a disaster or flood subculture, but in this particular instance the flood crest was much higher than the city had experienced previously. Because a flood of this magnitude was completely unanticipated, the department utilizing its standard operating procedures could not cope with the flooding.

How did the department adapt to the flood threat? Because its normal structure lacked sufficient flexibility to deal effectively with the demands it faced, it deviated from its rather tightly structured bureaucratic procedures (i.e., it debureaucratized) long enough to deal with the increased demands and later returned to its normal bureaucratic state when their emergency responsibilities were met. Organization officials, themselves, realized the deviation from its normal state. This was reflected in their statements such as: "Our operation wasn't one that was nicely organized in a hierarchy and so forth." "We threw the normal chain of command by the wayside after the first few days."

First, the department ceased to be as autonomous as it had previously been. Although the administrative machinery still existed, it was often modified. For example, the chief engineer, whose normal duty was to head up the department, became liaison between the engineering department and other city agencies -- leaving his normal responsibilities to the assistant chief engineer. The hierarchical character of the department was changed. Officials felt that the organization as it normally existed could not cope efficiently with the threat. Several bureau heads were placed either higher or lower in

the authority structure than was normal. Others were assigned either modified or completely new responsibilities. For example, the maintenance engineer was elevated above his cohorts and placed in charge of all field operations and general coordination. This placed him directly under the assistant chief and one level above the other bureau heads. Also the tasks and scope of his authority were not clearly delineated as they are in a tight bureaucratic organization. In addition, segments of two other organizations were incorporated within the structure of the DPW. Engineering department officials felt they needed additional manpower. They hired 15 carpenters and several hundred off-the-street volunteers. One DPW official told us that, "They worked under our unit, right here in the department of public works. We consolidated or concentrated it within the department of public works, the entire operation." In addition, elements of a civil defense unit worked under the engineering department as an integral part of it. As time was of the essence, there were few attempts to determine the competence of new employees by normal bureaucratic methods (i.e. interviews and/or examinations). Some of the structural changes incorporated into the department can be seen by comparing Figures 7 and 8. Figure 7 shows the department's normal structure, while Figure 8 depicts its new structure during the threat of severe flooding.

An administrative core developed informally which took charge of disaster-related operations. The core consisted of personnel from several levels of the organization selected on the basis of their technical and/or leadership skills. Some of the core members had dual roles to perform -- they carried out their normal roles, as well as their new role of core member. For example, in addition to their responsibilities as bureau engineers, two core members were placed in charge of purchasing all disaster supplies. They were given a free hand in ordering crucial equipment without written purchase orders or going through the normal chain of command. The department's purchasing division, which normally handles the ordering and securing of all supplies, did not become involved in the emergency operation. Another core member was asked to take a complete pictorial account of the engineering department's activities during the flood threat. Note that although these tasks were completely new for the individual members, the department as a whole still confined its activities to its pre-emergency defined responsibilities (Type II response).

Still other nonbureaucratic changes were incorporated by the organization to increase its efficiency in coping with the threat of crisis. Administrative control over the organization still existed, but decision making was greatly modified. In normal times decisions from the top level down followed a pre-arranged procedure. But with the threat of flooding, certain changes in the decision-making process occurred. At first glance our data appear contradictory. Upper level personnel supervised more and made more decisions during the emergency than during normal periods. At the same time lower level personnel told us that they were supervised less and made more decisions independently during the emergency than during normal times. Can they both be correct? Yes. What has, in fact, frequently happened in the past was that the higher echelon personnel supervised more, but at the same time, matters requiring immediate decisions on the part of the lower echelon mushroomed all out of proportion to the supervision. Thus, in

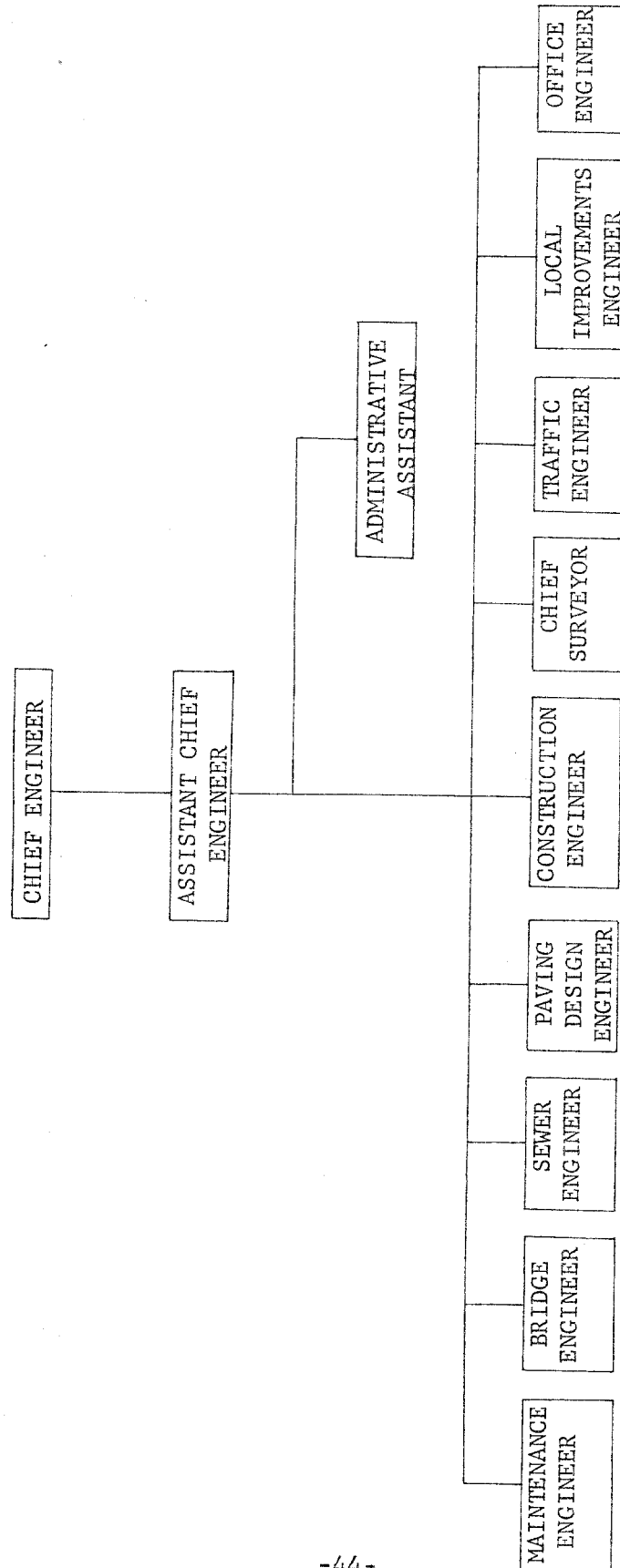
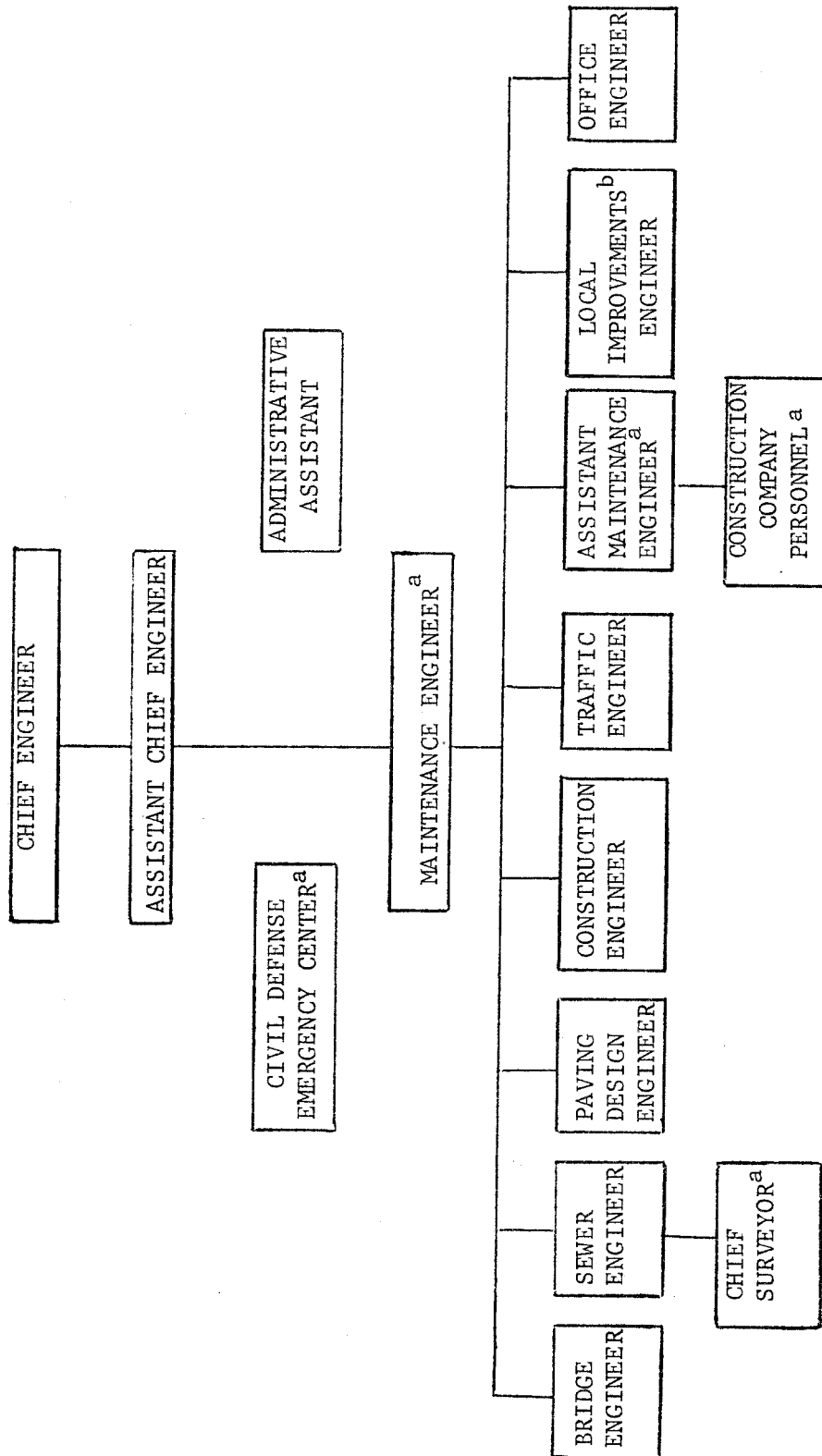


Figure 7. -- Organizational Chart Showing the Normal Structure of the Department of Public Works' Engineering Department

Figure 8. -- Organizational Chart Showing the New Structure of the Department of Public Works' Engineering Department



^aDesignates new or altered components of the organization's structure.

^bThese bureaus were not directly involved in emergency activities.

raw numbers the instances of supervision of upper over lower level personnel increased, but the ratio of supervised decisions to unsupervised decisions decreased. Therefore, various levels within the department (especially the lower levels) became more autonomous -- making a greater percentage of the decisions without consultation with higher officials. This relationship is shown in Figure 9.

In addition to the quantitative change in the number of unsupervised decisions made, a qualitative change also took place as the demand level increased. At every level within the organization the personnel made more important decisions during the height of the disaster than they did prior to the emergency. It was as if everyone in the department had been promoted a level; the crew leaders made decisions formerly reserved for their foremen; the foremen, in turn, made decisions normally handled only by their supervisors, and so on. This temporary "promotion" was not unique to this particular disaster or even to the DPW. It has been a common phenomenon during emergency periods, but just as quickly as it has arisen, it has subsided when the emergency period has passed.

Finally, most decisions were verbalized. For the time being, written records were kept to a minimum. In the words of one high ranking official, "I tried to impress on everyone that they should get as much of a written record as possible, but necessarily in the interest of time, a good many more verbal instructions were given."

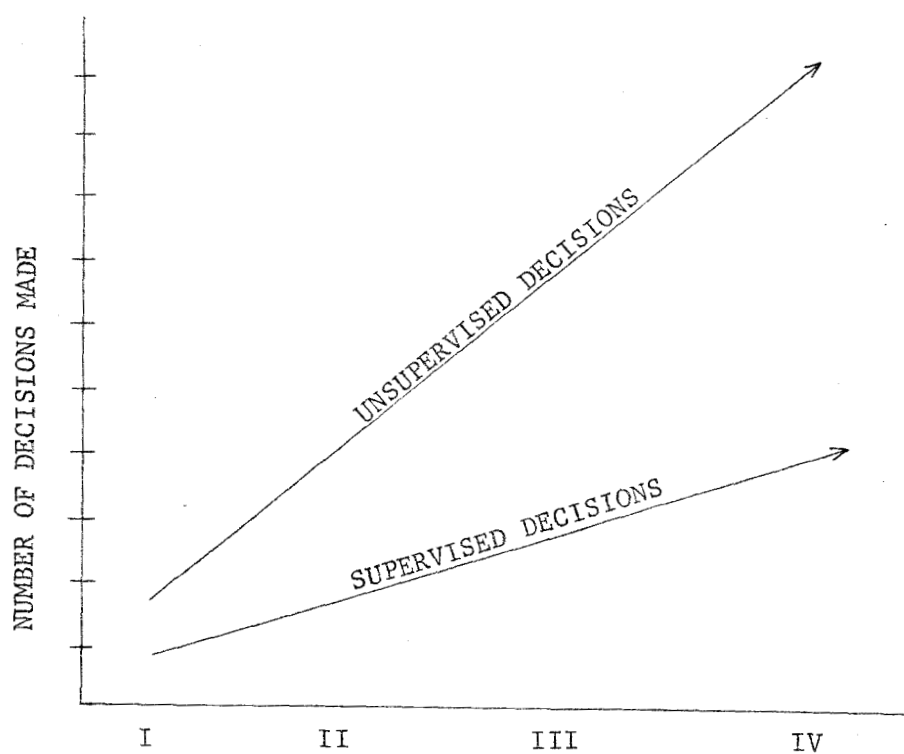
It should be noted that in practically none of what we have described was it a so-called "informal" structure that took the place of the formal structure. In the stress situation, prior friendship ties, implicit understandings, etc., were a factor in the response that occurred. However, what is important for our purpose is that at the organizational level the informal relationships and norms did not take the place of the formal structure when the organization adapted to the crisis.

In the foregoing we have described the debureaucratization of a unit of a DPW in a large metropolitan area. Although admittedly brief, some of the many ways an organization adjusts to the threat of a disaster have been described.

Thus far, we have limited our discussion to a description of structural changes within a DPW stemming from a flood. Any other natural agent may also present sufficient demands on the department to cause it to "throw the rule book by the wayside." Such was the case during the great 1967 Chicago snowstorm. Chicago normally experiences heavy snows during the winter months, for which the streets and sanitation department has developed extensive emergency plans for dealing with snow removal. In the past, the plans have been quite effective in removing snow with minimal disruption to the community (Type I response). In 1967, however, a major community, as well as organizational disaster occurred.

Twenty-three inches of snow fell on the city during a 29-hour period. Although the snowfall did not present a direct and immediate threat to the

Figure 9. -- Ratio of Supervised to Unsupervised Decisions of Lower Echelon Personnel During Several Levels of Emergency Demands



highest priority valued ends of the community (that of life and limb), the potential threat to these valued ends definitely existed. Transportation in most sections of the city was nonexistent. Should a major emergency have arisen requiring persons to be moved to hospitals, it would have been impossible except via helicopter. Similarly, if major fires had broken out, the fire department would have had difficulty in responding to them. Fortunately, neither of these potential problems arose.

The snow disrupted the daily routine of a vast metropolis involving millions of people in a way few peacetime disasters are able to achieve. For about two weeks, major organizations (including the streets and sanitation department) had to struggle with both qualitatively and quantitatively different demands than were normal for this time of the year. In this sense, the massive snow had far more consequences on community life than do most spatially and temporarily localized catastrophes.

Initially, the streets and sanitation department's sanitation bureau responded to the heavy snows using its normal emergency procedures. These procedures, which were spelled out quite specifically in writing, had been very effective in the past. Using its bureaucratic response the department attempted to carry out its pre-defined tasks (Type I response).

But midway the first day of the heavy snow, it became evident that the emergency plan could not continue to be used; the bureau's normal structure and resources were simply insufficient to handle the excessive demands which it faced.

○ The structure of the department changed completely in a matter of hours. The mayor gave snow removal top priority and asked that all city departments cooperate with the sanitation bureau in working at this objective. He also made a public appeal for additional equipment -- especially for tow trucks, high lifts, and front-end loaders. The sanitation bureau's normal emergency headquarters remained the command post for the assault on the problem, with the bureau of sanitation directing the city's snow-removal operation. Several organizations sent personnel to the command post -- police department, fire department, Chicago Transit Authority, public works' forestry bureau, and the water and sewers department's sewer bureau. Most of the commissioners and the mayor spent considerable time at snow removal headquarters coordinating the activities of the various departments. The telephone company installed 20 extra phones within two hours, and the sanitation bureau brought in an extra radio to supplement the one already located there. For several days, the snow control headquarters, under the direction of the bureau of sanitation, was the sole command post. These unprecedented demands made on the organization, along with its new role as coordinator, forced it to modify its structure.

Like the engineering department in our previous example, the streets and sanitation department also debureaucratized. Lines of authority and decision-making processes were modified. The subunits operating in the field functioned more autonomously than normal; written records were kept at a minimum; and formal communication patterns were greatly altered.

Other examples could be cited, but the same pattern of organizational behavior emerges. In all cases, it continues to carry out (1) pre-defined emergency tasks but (2) with a greatly modified structure.

LEVEL IV: Unanticipated Disaster II

At times the disaster is of sufficient magnitude that the organized community response is insufficient to cope with the demands even with the structural modification of many emergency organizations. At this level certain important community-valued functions are initially neglected; therefore, at least one organization must expand its domain if the task is to be done.

Actually every organization undertakes some new tasks during an emergency, so the imaginary line separating Levels III and IV is somewhat arbitrary. For example, we stated earlier that in at least two instances the DPW (an engineering department and a streets and sanitation department) undertook a new task -- coordinating the community emergency response. We chose not to view this as a completely new responsibility, however, because the coordination function was undertaken only to support the department's pre-defined responsibilities.

It is, indeed, a rare occasion when a DPW engages in completely new major responsibilities during disasters. Search and rescue (not on water)* has been one of these rare tasks. This situation has occurred in isolated instances in major community disasters when (1) the highest valued ends (personal life and well-being) are threatened and (2) no other group seems to be coping adequately with the problem. It is quite understandable how this organization might become involved. First, departmental personnel are often among the first emergency organizational members at a disaster site, clearing debris from major transportation arteries. Second, the department possesses equipment and skills which are often necessary for successful search-and-rescue activities. As we mentioned in the last chapter, the department engaged in search and rescue in the Worcester tornado and Alaskan earthquake; in the latter, however, much of the activity was carried on by DPW personnel but not as members of the organization. Although this Type IV response is quite common among some community organizations, it has normally not been an important mode of adaptation for the typical DPW.

Figure 10 describes the four levels of demand to which the department* may have to adapt: normal daily activity, seasonal or periodic emergencies, disasters in which important community functions are initially not left unattended, and disasters in which important community functions are initially left unattended. Only in the latter two situations were the demands sufficient to cause unanticipated or emergent structural change in the organi-

*The limitation "not on water" is imposed because search-and-rescue activities where boats and amphibious vehicles are required has long been a regular emergency task of DPW. For example, the DPW's in several Florida coastal cities have often undertaken evacuation operations during hurricanes.

DEMAND LEVEL	TITLE	TASKS	STRUCTURE	TYPE OF ADAPTATION
I	NON-EMERGENCY	NORMAL	NORMAL	I
II	EMERGENCY	NORMAL	PLANNED MODIFICATION	I
III	DISASTER I	NORMAL	UNPLANNED MODIFICATION	II
IV	DISASTER II	NEW	UNPLANNED MODIFICATION	IV

Figure 10. -- Relationship Between Level of Demand and Subsequent Type of Organizational Adaptation

zation. A good case could be made for referring to Level II as an anticipated emergency for the organization, while Levels III and IV as disasters for them. As was intimated earlier, one cannot differentiate between an organizational emergency and a disaster solely on the basis of the disaster agent and subsequent physical disruption. A more important criterion is whether or not the organization was forced to undergo unanticipated structural change. Finally, when attempting to predict whether or not structural change will occur in an organization, at least two other factors must be considered: (1) the extent of the organization's pre-planning for the emergency and (2) whether or not the department is operating in a disaster subculture. We will discuss both of these points more intensively later.

Organizational Expansion

The DPW is capable of expanding in two ways, internally and externally. Internal expansion refers to the movement of resources and personnel from one or more subunits of the department to another in order to increase the capabilities of the latter. The DPW has tremendous expansion capabilities within its own boundaries. There are many divisions and bureaus with extremely diverse responsibilities; a disaster normally poses demands directly on several, but certainly not all, bureaus. Hence, the disaster-relevant bureaus can draw personnel and resources from other bureaus within their own department. External expansion, on the other hand, refers to the movement of resources and personnel into the organization from the outside.

The engineering department, discussed earlier in the chapter, used both internal and external expansion. Figure 8 shows this internal shifting capability so often displayed by the DPW. It is only a slight exaggeration to interpret the structural change which occurred as the movement of the entire personnel and material resources of the department into the maintenance bureau under the supervision of the maintenance engineer.

Generally, the department prefers internal to external expansion because fewer problems of coordination arise in the former. DPW personnel have a history of movement in the department in normal, periodic emergencies, and disasters. They already possess the necessary skills, and, therefore, need little training. In addition, they are familiar with the standard operating procedures of the department, and, hence, require minimal supervision in the field.

During major community disasters, however, the department's internal expansion may be insufficient to meet the heavy demands it faces; it may have to enlist the aid of extra-organizational personnel through enlisting volunteers or hiring individuals or segments of existing organizations. The engineering department in our previous example did just that by incorporating a unit of civil defense, hiring carpenters, and taking on numerous unskilled individuals. Many problems may arise when the department has to resort to these measures, as one DPW official related to us:

We hired and took on flocks of additional people. So many things were going on at once that I think there was a breakdown of communication within each level of supervision. The foremen had so many men working directly under them that they had difficulty keeping track of them. With everyone moving about, there was general confusion and chaos.

It is quite uncommon for the department to take on volunteers, if by volunteers you are referring to persons who willfully give their time without accepting any sort of remuneration for their services. Certain groups such as the Boy Scouts have offered their services free but the usual case is for persons who enlist their services to be paid. In a strict sense, they might be considered hired personnel, but for our purposes they are volunteers. They are similar to what Dynes refers to as "walk-ins";² they have little training or skill and no previous organizational connection.

At times, volunteers can and have been used quite successfully with minimal problems; this occurs when the tasks which they perform require little training and which can be undertaken with minimal supervision. Volunteers physically separated from the rest of the department except for supervisors can undertake such activities as filling sandbags, loading and unloading supplies on vehicles, patrolling dikes at night, and clearing debris by hand.

But the department requires extra-organizational personnel to undertake other types of tasks which require at least some training and coordination by DPW personnel. In these situations volunteers pose problems, a major one being control. The department's emergency plan and departmental structure is not geared to incorporating a large number of "outsiders" into the organization during the emergency. Many emergency activities require some training and coordination. A large public bureaucracy, not anticipating ever having to incorporate the services of this type of volunteer into its mass assault, is caught short when all of a sudden DPW officials realize they must train and supervise the new personnel. The department, which had been used to operating with semi-autonomous, highly trained crews following a standard operating procedure and without extensive direction, now finds it must radically shift its structure in order to supervise volunteer activity. One official characterized the volunteer problem quite succinctly as follows:

We do not have city people (DPW personnel) numerically enough without at least robbing everything in the whole city to meet the demands, so we had two alternatives. One is to call for volunteers. Now working in the area where we were down there, the idea of volunteers didn't appeal to me very much. Secondly, if it was a routine sandbagging where you just turn them all off by themselves and let them fill bags, that's one thing. But we were working around flood walls, putting plywood up; we had carpenters with explosive cartridge guns; and

one side of the wall was ten feet above the ground all the way along. It wasn't the kind of place that you want little old ladies and girls and teenagers. Also, we thought that calling for volunteers would bring a mass of people, sightseers and everything else down on our backs so we wouldn't be able to accomplish anything.

So we hired outside civil service labor. The scale for that is \$3.60 an hour, 40 cents more than a lot of our own people are making. Now a whole bunch of "snotty-nosed kids" showed up available to work. Well, we needed people and wound up putting these kids to work. Some were utterly worthless. The number of them was so great that we had difficulty keeping tabs over them all, like you know what I mean? We had erected a time-keeper on the spot down there and he was to check in everybody and give them out to various foremen and at the end of the shifts, "clock them out," so to speak. But the number was so great and there was so much going on -- trucks coming in, vehicles and equipment, materials and everything else -- that there was a certain amount of confusion.

For one thing, I think we failed a little bit. If I had to do it over again, I would not hire that kind of people. I would arrange somehow to hire an emergency labor category at a lower wage, say \$2.25 an hour or something of that kind. Because what happened was that our seasoned people, who know the flood system, worked like dogs and some of them got only \$3.20 or \$3.50 an hour. These "snotty little punks," some of them which I think could have sneaked off to a restaurant somewhere and had a four-hour coffee session, got \$3.60. That's a disgrace.

And if we ever do it again or if anything like this comes up again, we will make more certain that we have better control of them, maybe have a foreman give each one of his regular city people 10 fellows or so. We wised up real quick after the first few days but by that time some of the big splurge was over with.

Although the DPW official was extremely negative toward the volunteers, he pointed out quite explicitly some of the major problems that the department has with volunteers. He found "control" to be most troublesome, a point which we have previously discussed. A second major problem stemmed from the fact that the volunteers received more money than many full-time DPW employees. This raised problems for the organization which it doesn't encounter when the "free" volunteer is utilized. In the former case, strong resentment and a lowering of morale occurred on the part of DPW personnel.

The department has fewer problems with skilled extra-organizational personnel which are incorporated into the organization during a major community emergency. First of all, they are normally fewer in number. Second, training is unnecessary and control is not a major problem. In our previous example of 15 carpenters from another organization being brought into the organization, they were very rapidly assimilated into the department. Because the carpenters had similar skills to many DPW personnel, communication and coordination were no problem. A parallel appears to exist where a telephone company in a city mobilizes for a major emergency. It brings in telephone personnel from other regions. Although they have not worked with the organization in that particular city, they have the same skills and therefore pose minimal problems for the organization.

Sometimes the department can utilize an ongoing unit of another organization to undertake emergency activities. This works out particularly well if the unit remains intact and brings its own supervisors with it. Then, the DPW does not have to divert its own energy and supervisory personnel to coordinate and control the unit's activities. Examples of this are a Boy Scout troop to fill sandbags or to clear debris under the direction of the scoutmaster; the civil defense unit in charge of all DPW public information. Although there are advantages of utilizing these pre-emergency groups, the department has difficulty finding very many situations which allow their use. For this reason, they have never been a major resource in the DPW's assault on a disaster.

Where, then, does the DPW turn when it finds it has insufficient personnel and material resources to cope with the large increase of demands forced on it by major community disasters? The answer lies in the coordination of the DPW's activities with those of other community and extra-community agencies. It is to these interorganizational relationships to which we now turn our attention.

FOOTNOTES: Chapter IV

1. Harry Estill Moore et al., . . . and the winds blew (Austin: The Hogg Foundation for Mental Health, The University of Texas, 1964), p. 195.
2. Russell R. Dynes, Organized Behavior in Disaster: Analysis and Conceptualization (Columbus: College of Administrative Science, The Ohio State University, 1968), chap. vii.

CHAPTER V

INTERORGANIZATIONAL RELATIONSHIPS

Pre-Emergency Relations

No community organization functions with complete independence. The DPW is no exception. Sometimes it receives necessary material and services, while at other times it furnishes the same to other organizations. The interaction may be horizontal with other community organizations or it may be vertical with agencies on the district, state, or national level.

These pre-disaster relationships may have an important bearing on the type of response an organization or a whole community can put forth in an emergency situation. It is not just the fact that pre-emergency coordination exists; the quality of the interaction is also important, as was pointed out by an official of the DPW.

. . . it pays for governmental agencies to maintain normal inter-agency operations on a friendly, first-name basis, thus establishing mutual confidence and respect. Then the same relationship goes into play during a disaster. For instance, police officers promptly authorized Health personnel to enter barricaded areas, cooperated in quarantining foods, etc. Water, Public Works, Building and Safety and other responsible officials quickly and fully collaborated and cooperated in the whole project.¹

The more intertwined these relationships are, the more likely the community will respond effectively to a disaster. Without solid pre-disaster relationships among organizations, the community will tend to have a segmented response with each organization defining its particular area of responsibility without taking into consideration the actions of other agencies. Thus, unnecessary duplications will exist in some areas, while more important, other crucial areas will be left untouched. All of this points up the need for interorganizational coordination and pre-planning on the community level. It is not enough for an organization to have a well-practiced disaster plan which is unique to itself. Such a plan may be ample for coping with an internal disaster, but certainly not adequate in adapting to community disasters. •

Community Organizations

What are the relevant interorganizational relationships affecting the DPW? First, let's confine our attention to community level interaction, i.e., with other organizations on the same level as the DPW. We have already alluded to a few of the operating agencies which rely on or are relied upon by the department. The fire department is very interested in the maintenance of the city water supply. The division in charge of water distribution must supply water. Second, a close relationship also exists between the police and DPW. One of the most time-consuming tasks of the modern police departments is traffic regulation. When engineering problems arise, however, the police turn to

the DPW for assistance. As we described earlier, the latter is also responsible for snow removal which in turn is of great importance to traffic regulation. Also DPW has charge of traffic signs, signals, etc.

A third relationship exists between bureaus of municipal equipment, often a part of DPW, and other operating city agencies -- the former may service other organizations' cars and trucks. For quite obvious reasons DPWs coordinate their activities with those of the health department. Both organizations are especially concerned with the manner in which refuse is collected and disposed.

Another relationship often exists between the DPW and various private contractors in the community, and the latter may be an important potential resource in an emergency. Quite often the city for one reason or another does not choose to do all of its own construction work. The city may supply the manpower but under the direction of a private contractor (limited force-account work). Under another variation, the entire job is carried out by private contractors. But even in this situation, much interaction between the two agencies exists as city inspectors are required to work with the contractors throughout each step of the project. Most DPWs maintain a current list of many private contractors and just what equipment each possesses.

Important ties also exist between the DPW and certain nonoperating agencies including those dealing with planning, financing, public relations, personnel, purchasing, and laws and ordinances which vitally effect departmental operations.² The finance officer provides them with the services of skilled technicians in recruiting, testing, and classifying its personnel. In cities with centralized purchasing agencies, the DPW interacts quite intimately with them. A close relationship with city planning agencies is also important as these agencies prepare plans which relate to the physical facilities provided by the public works department -- streets, public buildings, sewers and sewage disposal plants, and so forth. The city attorney's office has frequent occasion to give legal advice and aid in connection with construction projects and other activities. If the city has a director of public relations, he would certainly be involved with DPW activities. Finally, close relations between the department and mayor or city manager are imperative, for he is the "chief officer" in charge of all public organizations.

Extra-Community Relations

Thus far we have discussed many ties which exist between a typical DPW and other community agencies. But this is only part of the department's total environment; it maintains ties with many extra-community organizations which are invaluable for all organizations concerned. On the state level, it maintains a close working relationship with the state highway department concerning the design, construction, and maintenance of streets and highways. Also the state health department, like its local agency, has an interest in local public works activities, particularly with water supplies, sewerage systems, disposal plants and refuse collection and disposal operations.

But coordination and communication with local and state agencies do not exhaust the department's contacts.

Municipal public works officials also have many direct and indirect contacts with various federal agencies such as the U.S. Bureau of Public Roads, the Civil Aeronautics Administration, the Housing and Home Finance Agency in connection with urban renewal projects, the U.S. Army Corps of Engineers on river and harbor improvements and flood control projects, the Public Health Service of the U.S. Department of Health, Education and Welfare and other agencies that administer grants or loans or provide certain specialized services.³

Thus, the DPW is a large community emergency organization with vast resources and skills necessary for an orderly functioning community in both normal periods and emergencies. It maintains pre-emergency ties with many community and extra-community organizations, and therefore, does not have to establish communication and cooperation for the first time after the threat of disaster has already presented itself. The fact that the DPW has pre-established links with many organizations and already possesses valuable information regarding their potential should facilitate their operation in an emergency situation which requires the type of skills and resources it possesses. Figure 11 depicts the organizational environment in which the department carries out its activities.

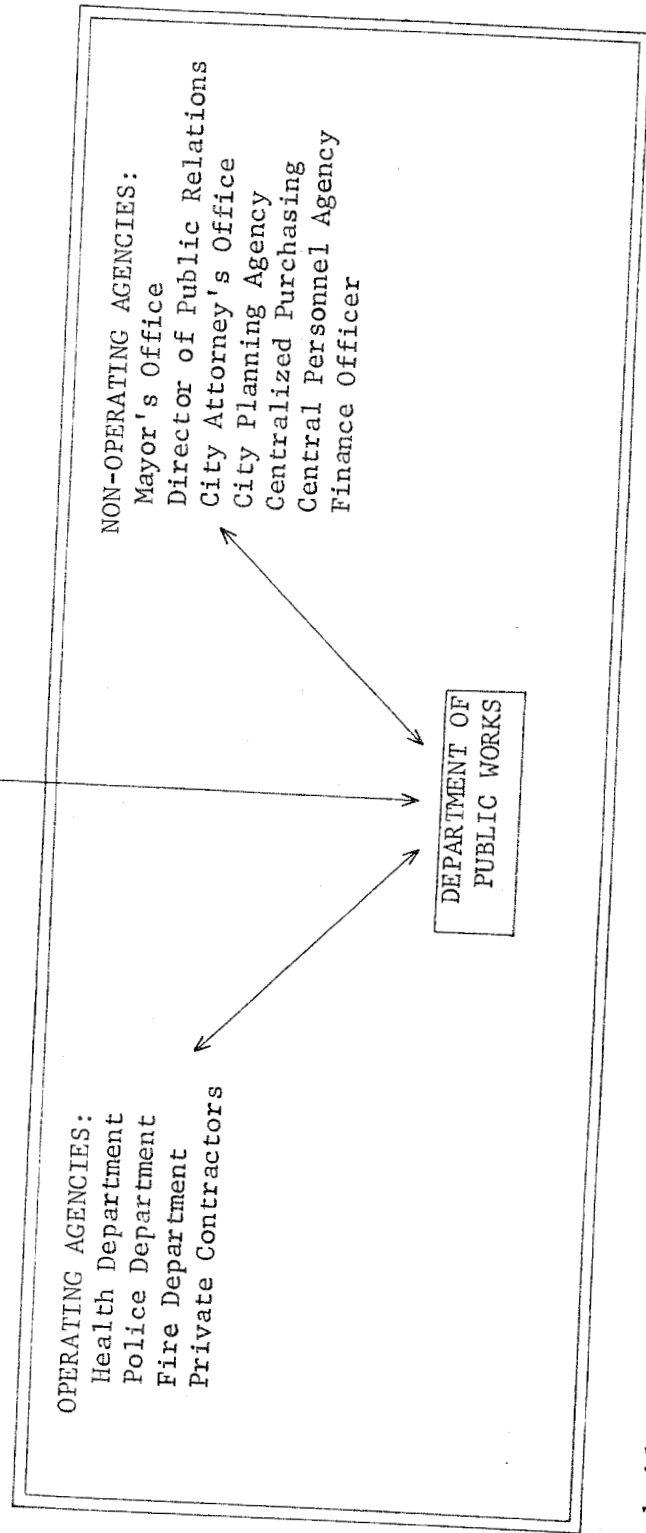
Emergency Relations

By definition, community disasters impose demands on many, not just one or two, emergency organizations. We have found that organizations coordinate their activities with each other in varying degrees of effectiveness. Some departments serve as disseminators of resources while others are recipients of the same. Hence, one usually finds heightened interaction among organizations during emergencies. The DPW is no exception; it also tends to lose its autonomy during disasters, and moves with other emergency organizations toward a somewhat unified response.

. . . the community begins to move toward a new super-organization in which to handle resource allocation. This comes about since involved organizations need additional information of the activities of others. Certain organizations . . . seek to find a place within disaster activity by suggesting that they possess resources and abilities which may be used. Information which identifies needs for resource allocation and information which identifies resources which are available come to be exchanged. One set seeks resources for the defined needs and the other set seeks needs for their resources. Both require information and impute authority to whatever individual or group can perform this brokerage function of information relating to definition of needs and availability of resources.

Figure 11. -- Relationships Between the Department of Public Works and Other Organizations*

EXTRA-COMMUNITY ORGANIZATIONS:
 State Highway Department
 State Health Department
 U.S. Bureau of Public Roads
 Civil Aeronautics Administration
 Housing and Home Finance Agency
 U.S. Army Corps of Engineers
 Public Health Department
 Other Agencies (which administer grants or
 loans or provide certain specialized services)



*The double lines (==) denote community boundaries.

If organizations can receive authoritative information concerning their needs for resources or their offer of resources, this adds authority to the source of information. If several organizations begin to attribute authority to a particular group or organization, this results in sending or seeking additional information. New organizations entering the system seek to receive or give information which, in turn, further legitimates the "headquarters." Gradually, the consequences of the disaster event come to be more clearly defined, the roles of the various organizations begin to develop a degree of structure.

This headquarters of the new synthetic "organization" . . . has a single purpose -- to cope with the consequences of the disaster event. It has been synthesized from parts which have been taken out of their normal context and now are reallocated and integrated in a different way. Its social units can no longer behave in autonomous ways, nor play a part in the pluralistic decision-making process. Instead the units become "subordinated" to a central headquarters which is allocating resources and integrating them through an "over-all" plan.⁴

Although any organization may be a part of the superorganization, more often it is the community emergency organizations* which are its major components. They have pre-defined emergency responsibilities and the necessary resources for protecting important community valued ends.

The shift from semi-autonomous pre-emergency organizations to an overall community organization has been quite common in the past disasters. Wherever we find an on-the-scene command post, the superorganization tends to evolve. Organizational boundaries often become blurred as the "new" organization develops its own structure. How effectively the organizations function together varies from disaster to disaster, but one conclusion is clear: They function more efficiently and have fewer problems if (1) the organizations have a pre-disaster relationship and if (2) part of the relationship includes a coordinated disaster plan.

With regard to the first point, the organizations with which the DPW works during the emergency period tend to be the same ones it works with in normal times. The DPW seldom finds itself in competition with these other organizations

*The community emergency organizations include police, fire, public works, public utilities (electric, gas, water, telephone, transportation), hospitals, public health department, coroner's office, Red Cross, The Salvation Army, mass communication agencies, civil government, and local civil defense.

with regard to solving technical problems or problems of authority. Both its normal and emergency responsibilities are clearly stated in writing and are well known and accepted as legitimate by the other emergency organizations, especially those with which it works most closely during an emergency. All municipal activities requiring engineering techniques for their satisfactory administration are commonly accepted as coming within the scope of the DPW. Also, it has not been known to attempt to enlarge its domain either by expanding its services or the population served. Even if it so desired, it would not be able to do so without the approval of the city (i.e., the mayor, council, or commissioners).

Second, unlike most emergency organizations, the DPW has sufficient responsibilities during normal times to keep it more than busy. Many emergency organizations do not have normal routine or nonemergency activities which occupy them fully prior to a disaster. Rather, a large segment of their organizations is geared to planning for emergencies.⁵ It is during disasters, and only then, that most of them become truly busy. On the other hand, the DPW is always busy; there is always garbage to be collected, streets to be built, buildings and other construction to be inspected, and so on. This means that after a disaster, it returns to a backlog of tasks which it must catch up on. Because of this, the department has no desire to increase its domain.

A third reason for relatively few instances of interorganizational conflict involving the DPW should be mentioned. A potential conflict exists where organizations possess similar skills and responsibilities. In this case, each organization has the capability of expanding into the same domain. The DPW, however, has very few responsibilities and skills which overlap with those of other emergency organizations. The positions within the organization require a relatively high degree of training, many of them related to engineering skills. Few other emergency organizations would be capable of taking over DPW's emergency activities. One of the few emergency organizations that would be in a position to compete with the DPW is the Army Corps of Engineers, the latter possessing similar technical skills. Our data show that conflict pertaining to jurisdictional matters has existed in several disasters. More often, however, the Corps, like the DPW, has a clearly defined domain which is primarily of an extra-community nature.

In cases where conflict does occur between DPW and other emergency organizations it normally happens when the department feels that the "prime coordinator(s)" is in some way interfering with the orderly solution of the technical engineering problems, that other organizations are infringing on its domain.

The local civil defense, for example, sometimes finds itself at odds with the DPW over which one should assume a role of coordination during disasters, especially in disasters which pose engineering problems for the community. Ill feeling toward local civil defense often stems from the fact that (1) their normal pre-emergency relationship was either poor or nonexistent or (2) civil defense did not have a clearly defined set of emergency responsibilities which were recognized as legitimate by other emergency organizations. Therefore, civil defense often attempts to undertake disaster activities which other organizations define as being within their own domain. Yutzy found such a conflict

between the DPW (engineering department) and local civil defense during the recent floods in Montana.⁶ Because the engineering department possessed the critical skills and resources necessary to meet the primary threat to the community, it became the primary authority in the city's effort to cope with rising water. Yutzy points out that the engineering department became the primary authority because it had the ability to cope with the demands.

Recognized capability involves such matters as technical competence, detailed information, preparation including recommendations for action; adequate equipment and a suitable location. In this disaster, it would seem that technical competence, detailed information and preparation were the most crucial. At Great Falls, the City Engineering Department demonstrated all of these capabilities. . . . This organization had information concerning the potential height of the crest, the probable areas which would be flooded, the preventive activity of the city. . . . This department had available, within its engineering subdivisions, a number of trained engineers. In addition, consultation with two private engineering firms had produced a consensus as to what would happen and what should be done. Finally, the City Engineer's office presented definite recommendations for action at the meeting where it emerged as the operational headquarters for the city during the emergency.

.
During the entire emergency period, as the crest of the flood approached Great Falls, there was jurisdictional conflict between the office of the City Engineer and local Civil Defense. At first, when Civil Defense did not attempt to control or coordinate much of the local activities, there was not much disagreement. The two offices operated somewhat independently. However, after the proclamation of the Governor, indicating that Civil Defense would be the official coordinating agency, there were several sharp verbal clashes between officials from the two offices. An impasse was reached with the City Engineer's office coming to handle most of the activity in the city and in some of the adjacent suburban areas. The local Civil Defense coordinated public information and took upon itself whatever else was not being handled at the Civic Center office.⁷

Yutzy goes on to describe just how the engineering department assumed command during the emergency. This leads us to a more general question: In what situations would one most likely find the DPW as a focal point of coordination among emergency organizations? In Great Falls, where the acting mayor and council members made no effort to assume control of the situation, the engineering department moved into the leadership vacuum. We would suggest that, even if the mayor and council members would have assumed control, they still would have assigned the city engineer as prime coordinator. Our previous research shows several cases where a mayor fully in charge of the situation appointed the director of public works as the primary authority.

In general our data show that the DPW becomes a loci of coordination in situations where the major threat to the community can be best met by the DPW. Not only was this true in Great Falls, it has been equally true in many floods throughout the United States. Normally the greatest threat posed by rising waters can be met most effectively by the DPW, whose responsibility is flood control. It has the technical skills and material resources for this situation.

During another flood threat in St. Paul, Minnesota, the mayor gave the chief engineer full authority and a "blank check" from the city to cope with the floods. He said, "Orders are to be given by the chief engineer's office only. We do not want everybody giving orders so as to have conflicting statements." The chief engineer chaired all of the meetings attended by the executive personnel of all emergency organizations. He was clearly in charge of operations. Again, the DPW possessed the necessary skills and resources to cope with the threat.

Floods are only one type of disaster in which one can expect the DPW to become a primary coordinator and authority. Major snowstorms are a second example in which the DPW plays an important coordinating role. The mayor or city manager, because he is familiar with the DPW's responsibilities and capabilities, often appoints the executive head of that organization as the primary authority in charge of operations. Such was the case in the 1967 Chicago snowstorm. The city's mayor explicitly gave the bureau of streets and sanitation primary responsibility in the snow removal effort and asked all other organizations to cooperate with them. To repeat, as was the case in major flood, the demands posed on a community by heavy snows can best be met with the resources and skills possessed by the DPW.

Another resource, a good communication system, should be mentioned. It would be extremely difficult for an organization without adequate communication capabilities to coordinate community organizations in a disaster, no matter what other skills and resources it possessed. As we discussed in Chapter II, the DPW is one of several emergency organizations with a well developed communication system.

Theoretically, then, the DPW could be the focus of coordination in any disaster, but we have found that it assumes this role primarily when the major demands made on the community require engineering skills to cope with them. In other types of disasters the DPW does not normally become the "prime mover" even though it may be heavily involved. For example, the DPW had the major responsibility for removing debris during the Worcester tornado, but because the most immediate demands did not require engineering skills for their solution, the DPW did not become primary coordinator.

Relations with Nonemergency Organizations

The DPW normally has more problems with nonemergency than emergency organizations. The latter are community-oriented having the same goal of protecting or restoring the community's valued ends in a disaster. Where differences arise

among them, it is usually over means rather than ends. Many nonemergency organizations, however, do not always adhere to the same community oriented goals. Many times the pressures they exert on the DPW inhibit the effective restoration of the community. For example, during disasters some business organizations set aside their profit goal in favor of more general community goals. But just as often many of these same organizations adhere just as strongly to the profit motive during the emergency, leaving the restoration of the community to "others." At times the DPW has problems with this latter element, especially when the cooperation of the business is necessary for full implementation of the former's activity. The DPW often finds it necessary to close off certain transportation routes in the event of flooding. Some of this blocking occurs where the road or railroad passes through a dike. Closure structures* must be built in advance of rising water if the dike is to contain the river. In one instance, the railroad officials did everything possible to postpone the building of a closure over its railroad bed. This was a vivid example of an organization more interested in maintaining profits than in community welfare as a whole.

There is another type of conflict or pressure which the DPW comes under. Certain organizations or persons in the community constantly apply pressure for the organization to take "care of them first" or not to undertake actions which would inconvenience them even though it would be best for the majority. "Plow my street first." "Don't build a dike there as it will cause greater flooding of my property." "Don't shut off my water to repair a main carrying water to a larger community." "You can't force me to evacuate my property." "My factory will be flooded out if you don't build a dike around it."

Because the DPW is a public organization, it can not always ignore these requests and undertakes only what it feels is the most rational. This pressure to cater to certain requests often deters the department from taking the most effective measures for the larger community. In a recent flood, one powerful organization wanted a second, backup floodwall built behind the permanent dike. After failing to persuade the engineering department to build one, it proceeded to influence the city council and newspapers. The result: the wall was built and as it turned out "the whole thing was worthless."

Still another type of pressure is often brought to bear on the DPW -- that is the pressure for information. This is especially true where the organization becomes the focus of coordination. Quite often in the past, the DPW has been bombarded by phone calls or people arriving in person at its headquarters requesting all types of information from "what streets are closed and why" to long distance calls asking, "Do you know where my Uncle George is?" In these instances, the DPW is forced to come to grips with demands not only directly due to the disaster agent, but also with those only indirectly related to the agent -- such as pressure for information. It is forced to undertake two types of coordination and dissemination of information. Its first and primary obligation

*Roads and railroads often pass through the concrete floodwalls. During flooding it is necessary to build a structure across the road or railroad between segments of the dike to keep water from getting behind the wall. These structures are referred to as "closure structures."

is to coordinate the activities of the emergency organizations in order to solve the technical problems posed by the disaster agent. But it is also pressured to be an information-dissemination organ. Nonemergency organizations, mass communication agencies, and the general public demand that the DPW inform them about certain aspects of the disaster. This means that the department must divert some of its energy from solving the technical problems it faces to developing means of information retrieval and dissemination. Often, however, the DPW is successful in insulating the segments of its organization engaged in "operations" from those segments engaged in "information giving." This allows operational personnel to focus on solving the technical problems uninterrupted by nonoperational problems. As was mentioned earlier, one city DPW incorporated a unit of the local civil defense to handle all inquiries from the outside and to issue departmental bulletins to them as pertinent information became available. The DPW publicly announced that:

THE CIVIL DEFENSE FLOOD INFORMATION CENTER WILL ANSWER ALL QUESTIONS CONCERNING THE FLOOD OPERATIONS AS FAR AS THE TAXPAYER, PRESS OR ANY OTHER INTERESTED PARTIES ARE CONCERNED. PLEASE FUNNEL ALL QUESTIONS TO THEM. ONLY OPERATING PERSONNEL AND PEOPLE HAVING TO DO WITH THE ACTUAL FLOOD CONTROL WORK SHOULD BE CALLING THE DEPARTMENT OF PUBLIC WORKS.

This particular DPW specialized further by separating the "operational" organizations into two groups: those concerned with the immediate problems of averting the flood and those concerned with what to do if the flood could not be averted. This division of labor worked out particularly well; operational personnel engaged in flood control were required to spend minimal time in "coordination" with every community emergency organization concerned with flood problems, allowing them more time in the field supervising flood-control operations.

In this chapter we have focused on the DPW as one of the many community emergency organizations. In general, a community emergency is not dealt with most successfully by a certain number of organizations working independently of each other, but rather by a number of semi-autonomous organizations coordinating their efforts to a common end. Therefore, the DPW adaptation to a disaster must be viewed in the total community context if its behavior is to be fully understood.

FOOTNOTES: Chapter V

1. Charles L. Senn, Sanitary Engineer, Los Angeles City Health Department, "Health Department Role in the Los Angeles Reservoir Failure," Public Works (April, 1964), p. 117.
2. Institute for Training in Municipal Administration, Municipal Public Works Administration (Chicago: The International City Managers' Association, 1957), p. 17.
3. Ibid., p. 21.
4. Russell R. Dynes, Organized Behavior in Disaster: Analysis and Conceptualization (Columbus: College of Administrative Science, The Ohio State University, 1968), chap. viii.
5. Although not a community organization, the United States Army is probably the best example of a truly emergency oriented organization. It spends an inordinate amount of time on "disaster" planning. To a lesser extent, the Red Cross, The Salvation Army, civil defense, fire department, and police department exhibit patterns similar to that of the Army.
6. Daniel Yutzy, "Authority, Jurisdiction and Technical Competence: Inter-organizational Relationships at Great Falls, Montana, During the Flood of June 8-10, 1964," Research Report No. 10 (Columbus: Disaster Research Center, The Ohio State University, September 25, 1964), p. 16. (Mimeographed.)
7. Ibid., pp. 16-19.

CHAPTER VI

IMPLICATIONS FOR ORGANIZATIONAL FUNCTIONING IN A NUCLEAR CATASTROPHE

In these concluding pages, implications concerning the operations of departments of public works will be projected into a more inclusive context of events which might occur in a nuclear catastrophe. The basic assumption made here is that the range of problems to be encountered subsequent to a major natural disaster are relatively similar to those to be faced in a nuclear catastrophe. Where there are differences, they can be visualized primarily as ones of degree. With the exception of the specific form of secondary threat, i.e., radiation, and the probability that a wider geographical area will be involved, a nuclear explosion would not create essentially different problems for community response.

It is assumed here that the delivery of a nuclear agent would come about by some type of military attack. Such attacks typically serve to activate and unify the civilian population in a collective effort to maintain community life, paralleling similar efforts observed after the impact of a disaster agent. Initially the problem-solving units which would respond after nuclear impact would probably be based in the local community. The burden of such a response would be assumed by the traditional emergency organizations, supplemented by other organizations which have additional relevant resources. In general, then, one might expect that the pattern of response which would develop after a nuclear impact would not be radically different from that which is seen subsequent to large-scale disaster impact.

Resources and Tasks

In mobilizing an emergency response to a potential nuclear attack, the DPW has important resources to be utilized. In most communities, the DPW has vast physical and personnel resources which are usually more extensive than any other single community organization.

It is useful here to indicate some of these potential resources. Most DPWs have an extensive communication network. It is used to coordinate normal activities within the department, not only via land-line but also via radio, at base stations and in many vehicles. This communication network can be of critical importance in the initial damage assessment. Such an assessment is crucial for emergency operations since it provides the initial parameters of the problems which the community must face. The department's network is particularly valuable since other extensive networks within the community, such as those possessed by the fire and police departments, are more likely to be heavily burdened with messages immediate to their own organizational tasks. While such messages provide parts of this necessary community reconnaissance, the DPW's communication network is not overloaded initially with its own emergency tasks and therefore has the potential of aiding in the overall assessment of damage to the community and its needs. In addition, such an assessment will be facilitated

by other resources of DPWs. Organizational personnel possess much information concerning the pre-impact status of the community. This information is in the form of records, maps, status reports and the pooled experience of many departmental personnel.

In addition to the availability of a communications network, DPWs also possess considerable resources in the form of transportation and construction equipment. They also have the personnel to operate and maintain such equipment. Too, the department usually has information regarding which private concerns, especially private contractors, have heavy equipment such as trucks, bulldozers, front-end loaders and so on.

Aside from these material resources, the DPW possesses personnel who are trained in a wide range of skills. Most departments have a large pool of maintenance personnel -- skilled, semiskilled, and unskilled -- who are trained to operate the heavy equipment available and who are intimately acquainted with the community. This acquaintance involves knowledge of where other community resources are physically located as well as the knowledge of the operation and maintenance of certain types of systems, such as water, sewage, streets, etc., upon which the subsequent community response depends.

Too, among the DPW personnel are usually a large number of trained engineers whose skills would be invaluable in solving certain engineering problems caused by nuclear catastrophe. For example, these engineering skills would be helpful in assessing the capabilities of shelters, especially in regard to the physical structure, or in determining minimum capability levels of water and sewage systems to maintain a given number of persons. Such engineering personnel would be important in damage assessment as well as in determining the safety of structures after impact.

While these considerable material and personnel resources can be utilized in a wide variety of ways in post-nuclear situations, it might be helpful to single out two specific tasks which could be anticipated with certainty and which would most certainly involve the DPW as the major problem-solving organization within the community. The two tasks to be mentioned are (1) the repair and maintenance of the street systems and (2) the repair and maintenance of water and sewerage systems.

Access to the damaged parts of the community is essential to the emergency operation of many of the other organizations which become involved. In the total impact area, streets will not exist so access is neither possible nor immediately necessary. Moving out from this epicenter, damage to streets would decrease but blast effects would still spread debris, blocking access or making travel difficult. The DPW, with its resources, is necessary to remove this debris and to make temporary repairs. Immediate attention to this task allows other organizations to accomplish their activities; some of which are urgent. Thus, the DPW becomes an important key in the chain of events.

The DPW is also central to the repair and maintenance of water and sewerage systems. While the distribution of water is not always an integral part of every DPW, in many cases it is. There is a high probability of widespread

fires as a result of the heat generated by the blast effects of nuclear weapons. The control of extensive fires would place heavy demands on a water system which itself might also be damaged. In addition to the fire control use, need for water for the surviving population would also have to be provided. In cooperation with health departments, the DPW would play a major role in the assurance of potable water. Closely related to these water problems is that of sewage disposal and again the DPW plays a major role in this. These are all critical tasks after impact and the DPW, more than any other community emergency organization, bears the major responsibility for their achievement. It should be emphasized, however, that the preceding discussion has touched only a narrow range of the potential tasks in which the DPW would become involved in the aftermath of a nuclear attack. The everyday activities of the DPW encompass a wide variety of activities and tasks. In many ways, the DPW is the "housekeeping" arm of the modern community and nuclear impact would necessitate extensive housekeeping.

Relative Effectiveness

In addition to the wide scope and the importance of the tasks in which the DPW would become involved in a nuclear situation, it can be inferred from observations based on disaster situations that the DPW would function with a high degree of effectiveness; that is, the ability of an organization to accomplish its tasks in the context of high demands. The disorganized behavior which many assume to follow dramatic crises is not confirmed by the observations of the performance of such organizations in a variety of large-scale disaster contexts. This same continuity of organized behavior could be expected in a nuclear context.

The major reason for the effective DPW functioning stems from the fact that, while it seldom can limit the demands made upon it, the department possesses great capabilities in the form of material and personnel resources and it is likely to maintain and utilize them. A number of reasons can be suggested for the ability of the DPW to maintain its pre-impact capabilities.

1. The DPW continues tasks in the post-impact situation which are similar to their pre-emergency operations. Most of the tasks with which the DPW would be involved would be almost identical with what it does normally -- street repair, repair of water lines, garbage disposal, et cetera.

2. The DPW operates on an emergency basis prior to impact. The DPW has developed standard operating procedures to deal with emergencies. Emergencies thus become routine, perhaps even anticipated. While the precipitating event and/or the impact agent may be new and unfamiliar, the tasks created and the procedures to handle them are thus familiar to the personnel within the organization.

3. The personnel in the DPW continuously expect to become involved in emergency activity. This expected involvement is seen as a part of organizational responsibility and is widely known to the members of the organization.

4. The DPW normally has "excess" trained personnel since it frequently operates on shifts to assume continuous normal operation. These "excess"

personnel mean that its operation would be less hampered by the loss of specific persons in the event of widespread impact.

5. The DPW has a high degree of interchangeability of personnel. It usually is composed of persons with engineering and construction skills. These skills are usually not restricted to specific assignments. A bulldozer operator may dig lines for water lines but he can also use these skills in clearing debris off a roadway.

6. The expectation that the DPW will become involved in each community emergency results in rapid and self-generating mobilization of personnel.

7. As we have already indicated, the DPW usually possesses extensive resources and organizational members know ways of obtaining additional resources.

8. Because the DPW operates as an entity in the pre-emergency period, its personnel have developed experience as a work group. Such previous experience results in greater certainty and security in its post-impact operations.

9. The top officials in the DPW generally have previously coordinated their activities with many of the other organizations in the community which could be expected to become involved in the overall emergency response. This is particularly true of other municipal agencies. This previous experience provides an initial advantage in the development of post-impact coordination.

10. Coordinating the activities of the DPW with other organizations is perhaps less necessary than it is with others. For a number of reasons, the DPW possesses more autonomy than do most other community organizations. In large part, the DPW works with tasks involving things rather than people. Too, the DPW usually deals with a "whole" task rather than being a link in a chain of events which, by definition, requires the cooperation of other organizations. For example, the DPW may be involved in repairing a ruptured water main, from the digging out of the pipe to its replacement. On the other hand, other tasks necessitate the cooperation of several organizations, such as the initial rescue of an injured person, his transportation to medical care and the provision of medical care. Such closely linked tasks require close coordination among the involved organizations and hence discontinuities are probable. Thus, the DPW can be more autonomous than are most other emergency organizations. In addition, the tasks with which it is concerned are not those for which other organizations have the skills, the physical resources or even the desire to assume.

In effect, the DPW holds monopolistic "control" over certain community tasks. Because of this, it is not required to enter into close cooperative relationships with the possible pitfalls which can result. On the other hand, the continued effective functioning of the DPW in a post-nuclear situation is essential since it deals with crucial community tasks in a monopolistic fashion.

Persistent Problems

While the overall evaluation of the potential effectiveness of the DPW is positive, judged on its performance in disaster situations, there are also

certain persistent problems which would perhaps be aggravated in a nuclear context. Some of these persistent problems, however, are intimately related to the previously mentioned strengths of the DPW.

1. The "invisibility" of the organization in its day-to-day operation, sometimes obscures its potential resources which could be utilized in emergency activities. As a consequence emergency planning, in some instances, ignores the role of the DPW and, in others, assumes not plans on its availability. Thus, DPW personnel often are not intimately involved in overall planning efforts. This "exclusion" often leads subsequently to insensitivity about the role of the department in actual emergency operations.

2. Because of its relative self-sufficient autonomy, the DPW itself sometimes resists attempts of post-impact community coordination. Its relative isolation sometimes shields it from sharing in the post-impact assessment of the overall range of community problems and its responsibility in their solution. Isolation often produces a consciousness of only the more immediately recognizable problems -- those which are already familiar to the DPW -- but it restricts recognition of others. In any emergency event which has widespread consequences, such as a nuclear event, the specific implications have to be seen in the context of a completely transformed community environment. By sometimes being excluded from close coordination with other involved community organizations the DPW has difficulty in seeing how it relates to other emergency organizations in the solution of these manifold problems.

3. The DPW has limited expansion capacity which it can utilize to adapt to increased demands. Unlike some other organizations, it does not have an equivalent counterpart within the community. A hospital, for example, may borrow personnel from another hospital in the community, but the DPW has few alternatives for supplementation, except perhaps from certain somewhat related organizations, as private construction companies. This is, in large part, a consequence of the fact that it deals with somewhat unique tasks in a monopolistic fashion. No other "housekeeping" organization exists within the community.

Too, since the DPW is a locally based organization, it cannot depend upon assistance from equivalent organizations in nearby communities. It is unlikely, for example, that one municipality would "loan" another a major segment of its DPW personnel and equipment. Too, in a situation of widespread impact, such organizations would be needed in their own locale. This locality base of the DPW also precludes using a type of resource available to some other organizations, that is, aid from state, regional or national sources. For example, a telephone company may borrow men and equipment from another segment of the national company, or the local Red Cross may be supplemented by regional and national personnel. The DPW, in large part, has to depend on supplementation from the local community and more particularly from those segments which are not already significantly involved in emergency activity. These factors place limits on the degree of expansion possible of organizational personnel and activities.

Another limitation of the expansion of the DPW lies in the lack of ready availability of certain types of personnel and equipment. Certain emergency-created tasks necessitate minimum skills and equipment; others require skilled personnel and specific equipment. The DPW usually is involved with both extremes. Certain tasks may require a high degree of engineering skill and scarce equipment. The lack of availability of additional personnel within the community with these skills therefore limits the possibility of accomplishing these tasks. The lack of availability of specific types of equipment also provides a limitation. Tasks which necessitate minimum skills and equipment can be accomplished by the addition of "volunteer" personnel to handle the excess over normal demands. But even the addition of volunteers is somewhat inhibited by cohesiveness of the regular members of the organization.

Because DPW is a community organization which operates as a unit on a daily basis prior to impact, it develops cohesiveness among its members. This cohesiveness is carried over to emergency activity and becomes an important factor sustaining energy and effort of the work groups. This positive element also has certain negative consequences for emergency actions in situations of widespread impact where it increases the number of persons involved. The degree of cohesiveness which has developed over time, however, creates problems for integrating the new "outside" personnel into the on-going organization. Earlier this was indicated by the resentment of permanent employees toward others being hired to work during the emergency period. While age and economic factors complicated this illustration a negative feeling developed on the part of organizational members toward this "outside" group.

These limits on expansion of the DPW do point to difficulties in attempting to deal with a situation of widespread impact, such as would occur subsequent to a nuclear event. These potential difficulties are somewhat reduced, however, with the normally strong ties the DPW has with two extra-community organizations -- the state highway department and the U.S. Army Corps of Engineers. In widespread emergencies, these three organizations often work quite closely together. The DPW has the knowledge of the resources and personnel available in both of these organizations. Because of the similarity among the three organizations, in the sense that their personnel all have engineering and construction skills, they can more easily work together providing a vital pool of resources. Such cooperative effort is more likely, however, in situations where impact is of somewhat narrower scope. The added resources of these extra-community organizations would less likely be available in events of a wider scope.

One final note should be made on the potential role of the DPW in a nuclear catastrophe. Based on observations made in a disaster context, there have been certain occasions when the DPW has become the major focus of community coordination. In other words, DPW personnel assume critical roles in the emergency process. These occasions seem to occur when (1) there is widespread physical damage and/or considerable difficulties in access to normal routines of community life or (2) the primary community problems can best be met by the DPW. More specifically, the coordinating focus seems to center on the DPW in widespread snowstorms and in widespread flooding. Since a nuclear situation would

create widespread damage, this would imply that the DPW would be centrally involved primarily because it has the engineering skills and the resources necessary to deal with such a situation. Because of this centrality observed in disaster situations, it is perhaps necessary to give greater attention to the role of the DPW in planning for possibilities of a nuclear situation.

14.	KEY WORDS	LINK A		LINK B		LINK C	
		ROLE	WT	ROLE	WT	ROLE	WT
	Cross-Cultural Interaction						
	Communication Under Stress						
	Laboratory Experiments						
	Sociological Simulation Studies						

ABSTRACT

The typical department of public works is a highly bureaucratic, public organization responsible for designing, constructing, and maintaining city property and certain services to the general public. It possesses specialized disaster relevant engineering and maintenance skills, extensive physical resources including large mobile equipment, and a fairly well developed radio communication system. Its two major categories of personnel, maintenance and engineering, are geared for emergency as well as normal operation. Maintenance personnel usually become active very early in the emergency period as they possess the skills necessary to divert secondary threats of disaster. On the other hand, engineering personnel become more heavily involved later in the emergency and post-emergency phases as they possess the skills necessary for more permanent restoration of community services. Several other findings should be mentioned. First, with the exception of floods and hurricanes, most departments are not active in community warning and pre-impact activity. Rather, they become most heavily involved after impact and remain so until well into the rehabilitation phase. Second, in all but the most stressful community emergencies, the department carries out its pre-defined emergency tasks with its normal structure. Third, the pre-emergency links which the public works department maintains with other organizations serve as an important basis for the efficient passage of information, personnel, and resources crucial for the solution of disaster generated problems. Finally, the department often assumes the role of "community coordinator" when the major demands on the community require engineering skills for their solution.